Industry and Power

December 1955

What to do with wastes when volume overtakes capacity . . 35

What you can do about boiler corrosion problems 40

New era on the way . . . high-frequency fluorescents . . 44

Fume elimination may be only half the story . . 47

What you should know about fuel oil additives . . . 50

Square D practices what it preaches 55

I & P takes you to the Power Show 58

Steam and power . . . profits and taxes 62

Upjohn beats wastes--p35

are man-hours slipping through your fingers?

P-A-X "inside" communication cuts this loss

P-A-X provides instant, person-to-person communication, anywhere within your organization.

When your people are walking about to exchange information, they're *wasting time.* What you need is a P-A-X Business Telephone System, to provide communication—in *seconds*—between all parts of your plant. The P-A-X system makes it easier to supervise and coordinate all operations, and maintain top efficiency.

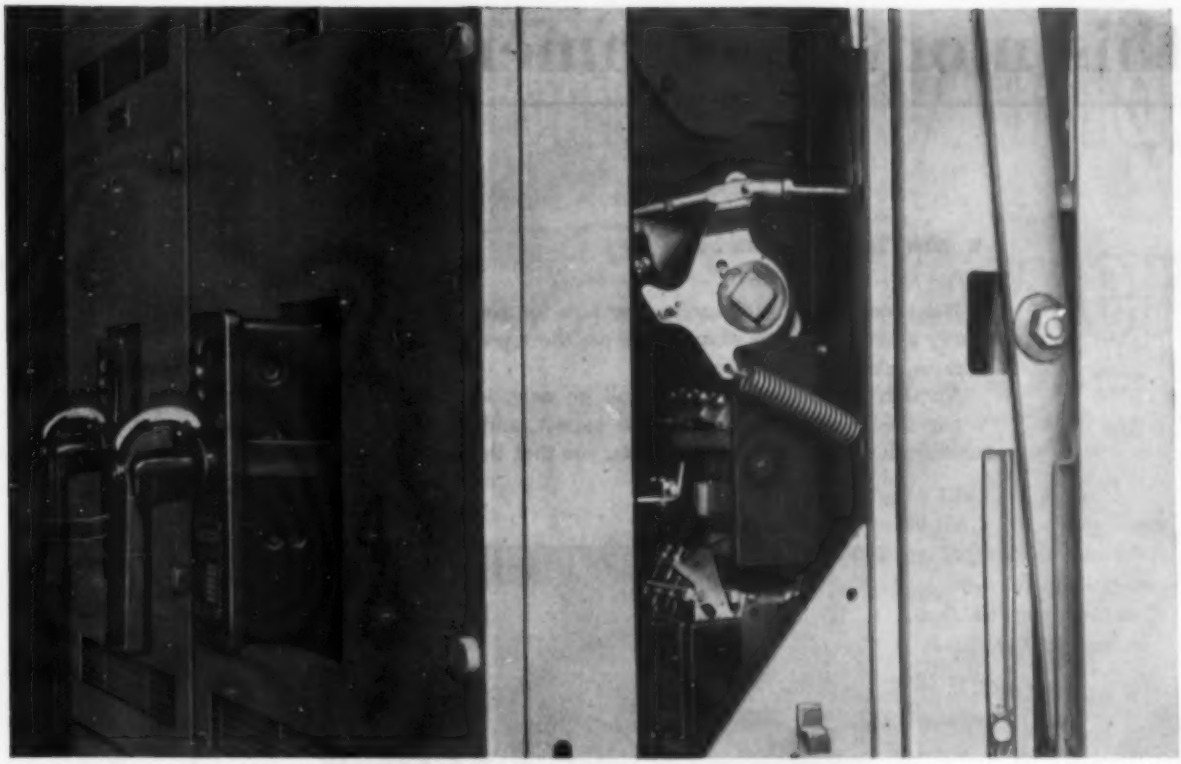
Rent-free P-A-X systems are privately owned and controlled—your own maintenance men install and move P-A-X telephones as you wish. Entirely separate from the public telephone system, P-A-X gives you lightning-fast service, always—no matter how busy the city switchboard may be.

Discover how other companies similar to yours are saving time and increasing efficiency, with a P-A-X Business Telephone System. For an actual "on-the-job" case study, *write:* Automatic Electric Sales Corporation (HAymarket 1-4300), 1033 West Van Buren Street, Chicago 7, Illinois. *In Canada:* Automatic Electric Sales (Canada) Ltd., Toronto. *Offices in principal cities.*

AUTOMATIC ELECTRIC

ORIGINATORS OF THE AUTOMATIC DIAL TELEPHONE

Circle 109 on READ-N-CIRCLE card for more data



Test position with doors closed now standard on I-T-E low voltage switchgear. This exclusive I-T-E feature is made possible by an extendable escutcheon which permits the operating handle and visual indicator of the breaker to extend through the closed compartment door when the breaker primary contacts are disconnected. Special cutout in side sheet shows breaker within compartment.

NOW—circuit breaker test position with doors closed

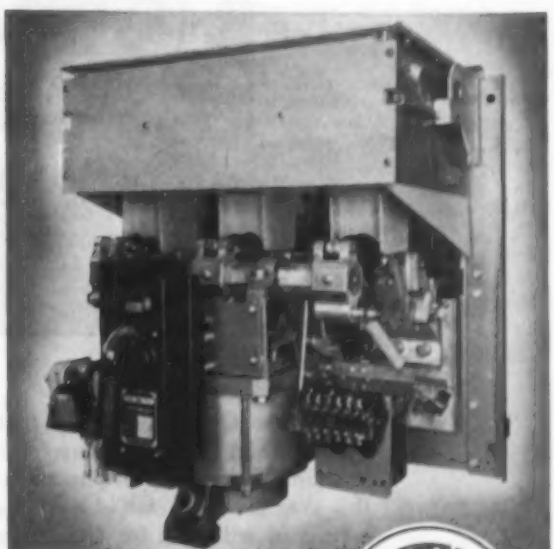
Exclusive I-T-E low voltage switchgear feature increases safety, reduces handling, provides better dust protection, permits easier circuit identification

Consider the many advantages of testing circuit breakers with compartment doors closed or of leaving de-energized breakers in their individual compartments protected against dirt and damage during installation and shutdown. Consider, too, the simplification of maintenance, inspection and "tagging out" of circuits during normal operation. They are all yours in the modern, compact design of the new standard I-T-E Low Voltage Switchgear—at no increase in cost.

New compact KD and KE circuit breaker design saves space

With the addition of the new KD and KE breakers, the line of K type breakers is complete through 4000 amp continuous, 100,000/150,000 amp interrupting @ 600/240 v a-c. Considerably smaller than their predecessors, Types KD and KE circuit breakers fit into three-high and two-high compartments respectively. This saves space, permits instrumentation in the same frame. In addition, the broadening of breaker interrupting ratings—now approved by NEMA—reduces switchgear costs by permitting the application of smaller size circuit breakers for short circuit protection on 240 v a-c and 480 v a-c systems.

For complete information, contact your nearest I-T-E sales office. Or write for Bulletin 6004B. I-T-E Circuit Breaker Company, 19th and Hamilton Sts., Phila. 30, Pa.



New Type KD circuit breaker typifies the latest design which extends the range of ratings of the I-T-E Type K family of breakers.

I-T-E CIRCUIT BREAKER COMPANY • Switchgear Division

Circle 112 on READ-N-CIRCLE card for more data

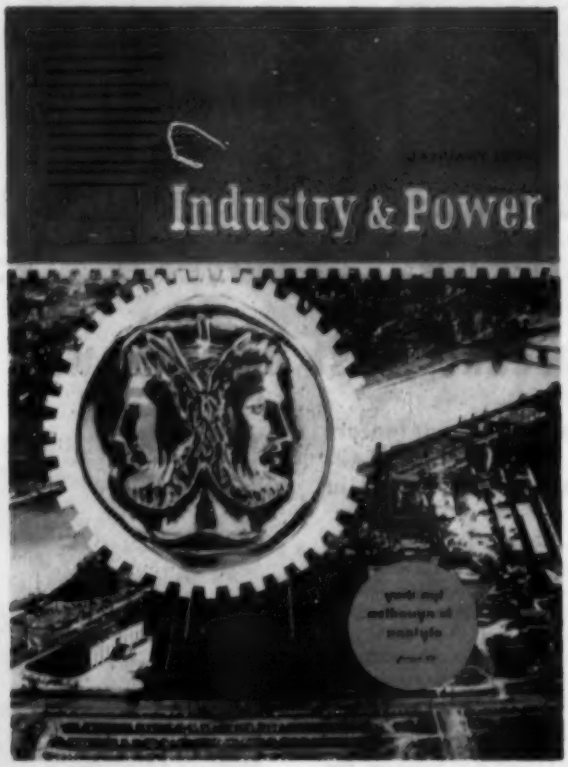
this month's comment

. . . from industry & power

a new face for you . . . .

Next month, we will have a new face for you. INDUSTRY & POWER will carry a new identifying banner across the top of its cover, and we would like to introduce it to you now.

Though the magazine's face will be new, its tradition will carry on along the lines you have come to expect, and indeed have encouraged us to follow. On the new cover, you see that the next issue shows Janus,



the Roman God, symbolizing that this will be the customary January "Review and Forecast" issue. This is a happy combination, we think. It couples cover improvement with our traditional January Review of this year and Forecast of next year for Industry's Power Services. We hope you will look for the January issue with some measure of the enthusiasm with which our entire staff is preparing it for you.

Harold A. Bergen, Editor

The John Paul Taylor Publishing Co.
Commercial Bank Building, St. Joseph, Michigan

Industry and Power

Volume 69 **December 1955** Number 6

SPECIAL FEATURES

What to do with wastes when volumes overtake capacity 35
S. J. Paradiso, Project Chemical Engineer
The Upjohn Company

What you can do about boiler plant corrosion problems 40
Ralph M. Lemen, The Permutit Company

New era on the way . . . high-frequency fluorescents 44
J. H. Campbell and J. L. Tugman
Lamp Division, General Electric Company

Fume elimination may be only half the story 47
H. Meigel, Plant Engineer
Reichhold Chemicals, Inc.

What you should know about fuel oil additives 50
Daniel Schoenholz and Bernard Berkeley
Product Development Department
Foster D. Snell, Inc.

Square D practices what it preaches about control centers and plug-in duct 55
Harold A. Bergen, Editor

I&P takes you to the POWER SHOW 58

Steam and power . . . profits and taxes 62
Michael Pope, Consulting Engineer

MONTHLY FEATURES

this month's comment . 4
nuclear news 6
new products 10
new bulletins 20
readers write 30
ideas in action 32
spot news 74
coming events 78
free bulletins 80
handy guide 83
good books 96
available reprints 98
names make news 99
advertisers' index 100

Established May 1920

John Paul Taylor, *Editor and Publisher*

Harold A. Bergen, *Editor*
Donald Hartley, *Associate Editor*
Robert W. De Moss, *Asst. Editor*
D. M. Adkins, *Editorial Assistant*
M. J. Holt, *Editorial Assistant*
M. B. Pratt, *Editorial Assistant*

A. T. Thornycroft, *Manager of Publications*
J. R. Jewell, *Production Assistant*

V. F. Donohue, *Manager of Market Services*
R. H. Gibney, *Reader Service*
L. A. Crabtree, *Circulation*

Sales Representatives

NEW YORK, R. P. Reynolds
11 West 42nd St.,
OXford 5-1495

PHILADELPHIA, D. L. McKechnie
816 Lancaster Ave., Villanova, Pa.
LAwrence 5-4692

CLEVELAND, F. S. Brandt
3292 Daleford Rd., Shaker Heights
SKyline 2-1649

CHICAGO, Tom Barron
360 N. Michigan Ave., Room 614
DEarborn 2-3519

LOS ANGELES, Justin Hannon
4710 Crenshaw Boulevard
AXminister 2-9501

BPA NBP

INDUSTRY & POWER (including INDUSTRIAL POWER) is published monthly by The John Paul Taylor Publishing Co., Commercial Bank Building, Saint Joseph, Mich. Member of Business Publications Audit of Circulation, Inc. and National Business Publications, Inc. Accepted as Controlled Circulation Publication at Saint Joseph, Michigan. Copyright 1955, The John Paul Taylor Publishing Co. Subscription information: Mailed without charge to executives and engineers, in selected plants and organizations, who are responsible for the selection, installation, operation and maintenance of equipment required for Industry's Power Services. To all others there is a subscription price of $10.00 per year in U.S. Outside U.S. subscription price $15.00. Single copy $1.00. Send Form 3579 to Saint Joseph, Michigan.

At times it pays to be blinded !

But certainly not when you analyze coal values. Before you contract or place an order for your coal supply, a comparative study of evaporative results should be made.

No coal is 100% efficient. But with a properly, uniformly sized coal you'll utilize a higher percentage of Btu content. This more efficient combustion means lower steam costs for you.

At our Enos and Enoco Mines . . . specific gravity washing, exact sizing and mechanical size blending produce a coal free of loose impurities, tailored to your stoker requirements. Each shipment is guaranteed to be of the same uniform size-consist and high quality. You'll find that exactly sized, properly prepared Enos and Enoco coals reduce Btu waste.

Why not give us a call today? Let us *prove* that superior preparation of quality Enos and Enoco coals give you more efficient utilization of Btu content for lower steam cost.

Place a trial order.
Make a test comparison.

THE ENOS COAL MINING COMPANY

Sales Offices for Enos and Enoco Coals

1405 Merchants Bank Bldg. Indianapolis 4, Indiana
310 S. Michigan Ave. Chicago 4, Illinois

Circle 116 on READ-N-CIRCLE card

nuclear news

. . . . about industry & power

WESTINGHOUSE READIES FOR COMMERCIAL NUCLEAR BUSINESS

Westinghouse has formed a commercial atomic power activity to include development, design, and sale of all commercial nuclear reactors. Charles H. Weaver, vice president in charge of atomic power for Westinghouse, sizes up the situation this way: "Atomic power is rapidly becoming a full-fledged industry with markets both in the United States and in foreign countries. It is a commercial business growing at an extremely rapid rate." To date, Westinghouse has built or is to build eight major atomic reactors.

NEW NAMES IN NUCLEAR ENERGY

Harold S. Vance, former chairman of the executive board, Studebaker-Packard Corporation, was sworn in as a member of the AEC for a term ending June 30, 1960 . . . . Edward O. Edney, Jr. has been appointed project manager for the nuclear power program of Westinghouse's Steam Division . . . . Dr. Lauchlin M. Currie has been appointed vice president of Union Carbide Nuclear Company, a division of Union Carbide and Carbon Corporation.

RELEASE COSTS FOR 10,000-KW REACTOR PLANT

Producer of the Army's Package Reactor, ALCO Products, says that today's approximate cost of a 10,000-kw nuclear power plant would be 1½ to 2 times that of a conventional steam plant burning pulverized coal. Fuel costs would be 7 to 8 mills/kwh, compared with 5 to 6 mills/kwh for chemical plants operating on fuel costing 40 cents/million Btu. Because operating costs are expected to be slightly lower for nuclear plants, the entire operating cost differential may disappear. Assessing such charges at a commonly accepted rate of 13½ percent per year, the total cost per kwh comes to about 1/3 to 1/2 more for nuclear power than for powdered-coal power. These are today's figures, and are not considered by ALCO to be overly optimistic.

PRIVATE ENTERPRISE CARRIES THE BALL

AEC figures show that 107,000 people are working in nuclear energy, but that only 6000 of them are on the AEC payroll. AEC chairman Lewis L. Strauss notes, "So great is the faith in the

coming soon . . .

electrical refresher

INDUSTRY & POWER will be bringing you another stimulating series of refresher articles covering the basic electrical background for your job. It will be aimed straight at you who have been piling up years of experience, and who would like to brush up on electrical. The technical level will require a background of engineering fundamentals — and no more.

Author of the series will be a renowned writer, associated with one of the leading engineering schools in the country. Watch for The Electrical Refresher, coming soon in

INDUSTRY & POWER

you can still get
I&P's special report on

control valves and positioners

One of the most popular of the many popular I & P Special Reports is the one on Control Valves and Positioners. Particularly valuable to you as an engineer is the wealth of outstanding illustrations in this particular report.

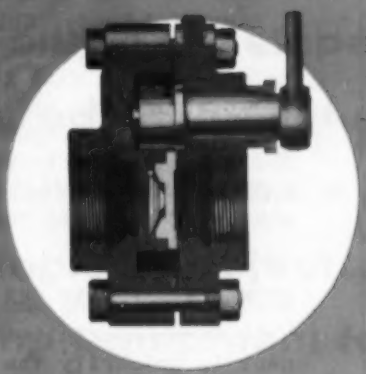
To meet the continuing demand for this special report, reprints are made available to all readers. Single copies are free; 2 to 24 copies are 25¢ each; 25 to 49 copies are 20¢ each; 50 to 99 copies are 15¢ each; more than 99 copies are 10¢ each.

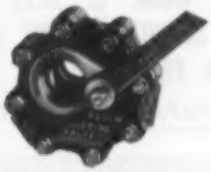
Address all orders to

Reader Service Department
INDUSTRY & POWER
Commercial Bank Building
St. Joseph, Michigan

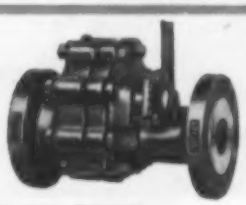
Everlasting Valves

are superior for many services





BOILER BLOW-OFF
Quick acting, also handwheel operated "Y" and angle types. For pressures up to 600 psi.



GENERAL SERVICE
Where drop-tight seal and full flow is essential.

CYLINDER OPERATED
Can be remotely controlled, electrically or manually.

STEAM JACKETED
Assures free flow of viscous materials.

WEIGHT-OPERATED
For automatic drains or emergency shut off.

When you want

- quick action
- drop-tight seal
- minimum pressure drop
- straight-through full flow
- self-grinding rotating disc
- valves that cannot wedge or jam

then you want an Everlasting Valve

No other valve has all the Everlasting features . . . proven by half a century of service to assure dependable, leak-tight service.

LET US HELP YOU WITH YOUR VALVE PROBLEMS

EVERLASTING Valves

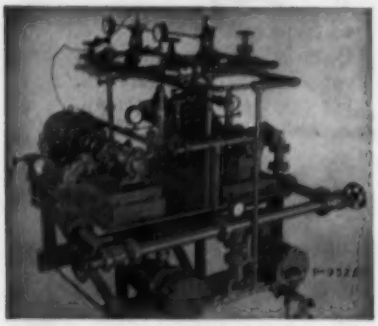
EVERLASTING VALVE CO.
41 FISK STREET, JERSEY CITY 5, N. J.

EV303

Circle 138 on READ-N-CIRCLE card for more data

COMPLETE RANGE OF SIZES AND MODELS IN BOTH MEDIUM AND HIGH PRESSURE TYPES

MORE COMPACT THAN EVER . .



P-952-A—Steam Turbine and Electric Motor drive gives flexibility in this compact Model P-ES2H size No. 25 unit.

NATIONAL AIROIL

FUEL OIL PUMPING AND HEATING UNITS

NATIONAL AIROIL Fuel Oil Pumping and Heating Units are specially designed to prepare, for combustion, all grades of fuel oil including No. 6 or Bunker "C" Oil and residuums. They will draw fuel oil from above ground or underground tanks, preheat it to proper constant temperature and deliver it to Oil Burners at an even pressure, best suited for the burners. Our Fuel Oil Pumping and Heating Units are the result of years of experience. They come completely equipped ready for steam, exhaust, condensate, oil suction, oil return, and electrical connections. All valves, regulators, etc., are readily accessible. The piping arrangement is easily understood. These compact, space-saving units are available in a range of sizes and models in both Medium and High Pressure types. For complete details, write for our Bulletin 40—very interesting and informative.

OIL BURNERS and GAS BURNERS for industrial power, process and heating purposes
STEAM ATOMIZING OIL BURNERS
SLUDGE BURNERS, Steam Atomizing
MOTOR-DRIVEN ROTARY OIL BURNERS
MECHANICAL PRESSURE ATOMIZING OIL BURNERS
DUAL STAGE, Combining Steam and Mechanical Atomization
LOW AIR PRESSURE OIL BURNERS
AUTOMATIC OIL BURNERS, for small process furnaces and heating plants
GAS BURNERS
COMBINATION GAS & OIL BURNERS
FUEL OIL PUMPING and HEATING UNITS
FURNACE RELIEF DOORS
OBSERVATION PORTS
SPECIAL REFRACTORY SHAPES

NATIONAL AIROIL BURNER CO., INC.

1391 E. Sedgley Avenue, Philadelphia 34, Pa.
Southwestern Division:
2512 South Boulevard, Houston 6, Texas
Circle 118 on READ-N-CIRCLE card

inevitability of atomic power than an increasing number of industries are prepared at this time to foot the entire cost of building and operating experimental plants, even though they know in advance that those installations will not be economic if one excludes from the return the knowledge we will gain from them." . . . . The great upsurge of interest in nuclear energy, as previously reported in INDUSTRY & POWER, has resulted in a 400-percent increase in reported sales of declassified documents sold through the Department of Commerce.

SARGENT & LUNDY FORM ATOMIC GROUP

Sargent & Lundy, Chicago consulting engineers, has formed the Atomic Power Engineering Group in association with 14 utility companies. The group will study reactor designs, technical characteristics, operating problems, suitability for applications to power systems, plus the nuclear, engineering, and economic aspects of a number of proposed reactor plants.

ATOM POWER BEYOND THE PHYSICIST

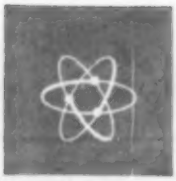
It is common belief that atomic power development is primarily the province of the nuclear physicist. Nothing could be further from the truth, according to Rear Admiral H. G. Rickover, chief of the AEC's Naval Reactors Branch. Rickover says, "Problems include the familiar ones of using materials at high temperature and pressure. They also include the ability to withstand corrosion to a very high degree . . . . In chemical combustion we are normally limited to a maximum of about 3000 F, but in nuclear fission we can achieve temperatures of millions of degrees. Moreover, we are faced with radioactivity and its tendency to distort and to weaken materials . . . . Metallurgy holds the key . . . . "

BRITISH REPORT THREE-BILLION-TON EQUIVALENT

The United Nations heard British estimates that nuclear energy will be able to do the work of two- to three-billion tons of coal a year, throughout the world, by the year 2000. Immediate goals in Great Britain are to have an installed nuclear power capacity of 1500 to 2000 mw by 1965, between 10,000 and 15,000 mw by 1975.

ACCESS PROGRAM ROLLS ALONG

More than 350 access permits have been issued to business concerns that have already demonstrated immediate or significant need for knowledge of classified information in connection with their business or profession.

NUCLEAR PUMP  LEADERSHIP

Byron Jackson
has either developed,
engineered, manufactured...
or handled as a
complete project...
pump equipment for
every nuclear reactor
in use in the
United States.

Write today for the special technical paper "Centrifugal Circulating Pumps and Auxiliary Pumps for Atomic Power Plants" prepared by Carl Blom, vice president and chief engineer (Pump Division). This paper, probably the most authoritative available, was presented at the conference sponsored by Stanford Research Institute and the Atomic Industrial Forum, San Francisco, California in April 1955.

BJ

Byron Jackson

A division of Borg-Warner Corporation

Mailing Address: P.O. Box 2017, Terminal Annex, Los Angeles 54, California

Circle 131 on READ-N-CIRCLE card for more data

new products

. . . just circle key numbers on READ-N-CIRCLE card on page 83

700-Plastic washboard window controls heat and glare

Window that effectively controls glare and solar heat while evenly distributing light is a one-piece louvered panel of molded plexiglas. Each louver of the window combines a clear transparent surface with an opaque surface. Lura-Lite panels solve the problem of providing adequate light without glare and excessive heat by permitting only the required amount of sun's rays to pass into a room, by reflecting some rays outside the building, and by diffusing and scattering others for maximum nonglare lighting. Panels are installed so that louvers are horizontal for maximum daylight control, but they may be installed vertically to provide a degree of visual privacy. Also available with translucent and opaque surfaces to provide better light control during hours when the sun angle is low by scattering light throughout the room. Available in standard sizes or to fit any specification. Panels are flanged on either side for easy weather-tight installation. Nonbreakable under normal conditions and completely weather-resistant. May be used in combination with conventional frames to provide means for ventilation, or set solid in walls for air-conditioned buildings. Panels are light-weight, which simplifies installation in upper floors where direct glare is often a problem. LURIA-COURNAND, INC.

701-Does your plant need extra heat in some areas?

This factory heating system reduces installation and operating costs. System uses individual Model VO-168 heat machines instead of a large, central-heating system. Units can be placed in any desired location, quickly vented outdoors, and put to work. They eliminate costly duct work, piping, diffusers and other central-heating system components. There is no need to heat whole plant when only one section is in use. Self-contained heating units have a heat output of 168,000 Btu/hr when unvented, 130,000 Btu when vented. Heaters eliminate total plant shutdowns caused by failure of main central heating system, and are ideal for plant extensions that would overload existing heating plant. FAGEOL HEAT MACHINE DIVISION, R. D. FAGEOL CO.

702-Portable motor meter defies burn out

Portable motor meter features new technique to protect both meter and entire internal circuit against accidental burn out. When overloaded, instrument disconnects itself and raises a reset button. Industrial Model 455 has a sensitivity of 20,000 ohms/volt, ac or dc. Audio Model 456 has a sensitivity of 20,000 ohms/volt dc and 1000 ohms/volt ac. Both models incorporate full-wave bridge-type rectifier circuit. Single selector switch speeds function and range setting. Batteries are accessible with-

BETZ • *A Great Name In Water Conditioning*

They all work for you!

It takes the combined ability and experience of many people to engineer effective water conditioning.

Few plants, however, can afford to maintain or establish an internal staff capable of supplying the constant flow of engineering knowledge, the diversification of thinking, the thousands of creative and supervisory man-hours that are necessary to the engineering, planning, and control of an effective water conditioning program.

By assigning the responsibility for result-getting water conditioning in your plant to the Betz Organization, you gain immediately the services of field, staff, and consulting engineers, researchers, chemists, and production personnel . . . *plus* the basic objectivity of an "outside" organization providing individual attention to your individual problems.

What's more, the services of these team specialists are available to you *without actually putting them on your payroll!*

Whether your problem requires boiler or cooling water conditioning, Betz completely-integrated service brings into play techniques, methods, and engineering that can make all the difference in *results.*

A Betz District Engineer, one of the many important members of the Betz service "team", will be happy to give you the details of our result-getting service. Why not call him in *today?*

W. H. & L. D. BETZ, Gillingham & Worth Streets, Philadelphia 24, Pa. In Canada: BETZ Laboratories Limited, Montreal 1.

BETZ

CONSULTANTS ON INDUSTRIAL WATER PROBLEMS

Circle 141 on READ-N-CIRCLE card for more data

new products

. . . starts on page 10

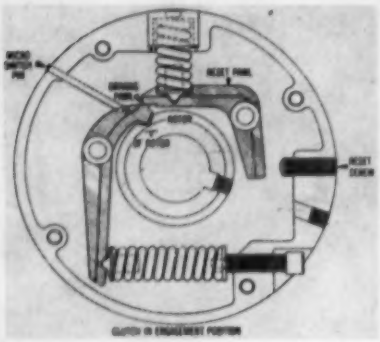
out removing case. HICKOK ELECTRICAL INSTRUMENT COMPANY.

703-Foot switch can be pressed anywhere

New circumference-actuated electrical foot switch makes contact no matter where it is pushed—on top or around its circumference. Can also be activated with hand, elbow, or knee. Particularly suitable for precise, involved, or dangerous processes, where operator must have both hands free. If two switches are placed in series, both hands must be used to activate them and operator's hands are kept well clear of machine. Operates on 110 volts, 10 amperes. THE BIRTCHER CORPORATION.

704-Weather actuated time switch

Weather-actuated time switch for day-night or seven-day programming of heating systems can be used in any space-heating control circuit. Outdoor temperature automatically resets time heating starts and time of cutback to assure comfortable temperatures when required. Weather-Chron stops all heat input when outdoor temperature rises above an adjustable preselected minimum. Added safety feature automatically eliminates night setback when outdoor temperatures drop below adjustable preselected level. THE AUTOMATIC DEVICES CO., INC.



705-Clutch prevents overloads

Clutch that prevents overloads in power drives by providing positive torque limits, has no wearing parts and a lock out design that gives complete disengagement. When clutch is in engaged position, it is preset to a definite torque limit by use of two fully adjustable coil springs. When clutch torque limit has been overcome by an overload condition, a Micro-switch is actuated and power supply is either shut down or a warning signal is actuated. Reengagement of the Centric Trig-O-Matic overload release clutch takes only a few minutes. CENTRIC CLUTCH COMPANY.

FREE INFORMATION

For detailed free information on these products just circle the key numbers on the READ-N-CIRCLE card on page 83.

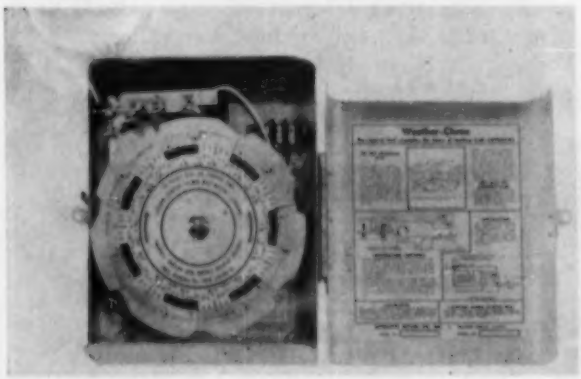
706-Direct-flow flowmeters

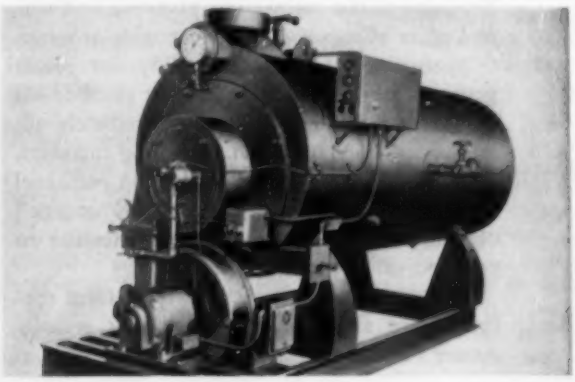
Indicating flowmeters with direct flow through the meter chamber are now available. Direct-flow design keeps housing clean. Flexing of the vane prevents any accumulation of scale or sludge. These total-flow class flowmeters are not affected by flow eddies due to pipe fittings. Free suspension of flexible vane allows instrument to operate in any position. Immune to vibration. Available with solid body and magnetically connected external vane, or with transparent cover. INSTRUMENTS DIVISION, SCULLY-JONES AND CO.

707-Boilers with secondary air dampers

Secondary-air dampers are now being incorporated into the blower housing of all Cyclotherm Steam Generators from 18 to 60 hp. Damper makes it simple to adjust secondary-air requirements. It can be adjusted

(more new products on page 16)





Are those all the ashes for the day?

That's all! We're using a low-ash coal now. The analysis shows only one-half as much ash as the coal we had been using, and there is a great deal less unconsumed coke on the refuse.

But don't we have to pay more for this kind of coal?

Yes, we may pay more at the mine, but it costs us less delivered. Remember we used to pay freight on all those ashes and then pay to haul them away. And because there is so much more usable coal in each ton, we use fewer tons.

Who showed us how to make this saving?

A C&O fuel service engineer gave us the facts and figures to show that this higher quality coal would really cost us less in the long run, and our experience has proved he was right. I am convinced now that you can't buy coal on price alone. It pays to get the advice of a competent combustion engineer and to pick the coal that will do the best job under your own set of conditions.

P.S.

There's a lot more to buying coal than the cost per ton. Why not contact coal producers on the C&O to solve your particular fuel requirements, or write to: R. C. Riedinger, General Coal Traffic Manager, Chesapeake and Ohio Railway Company, Terminal Tower, Cleveland 1, Ohio.

Chesapeake and Ohio Railway

WORLD'S LARGEST CARRIER OF BITUMINOUS COAL

Circle 115 on READ-N-CIRCLE card for more data

Paper Mills Choose for

WA-Series

STEAM TURBINE GENERATOR UNITS

Produce Economical Plant Power as By-Product from Process Steam

At John Strange Paper Company

MENASHA, WISCONSIN

5000-kw WA-Series unit produces power at 2400/4160 volts as a by-product of 150,000 lb per hour of process steam. Steam conditions at the turbine are 700 psig, 825 F, with 50 psig exhaust.

ALLIS-

Allis-Chalmers Units Power Generation

The paper industry is a good example of many industries across the country that are choosing modern Allis-Chalmers WA-Series steam turbine generating units for plant power generation. Many installations are already operating in NEMA ratings from 2000 to 7500 kw. Recently, the line was extended to 16,500 kw in AIEE-ASME preferred ratings.

WA-Series units are available for condensing or non-condensing service, with or without automatic extraction, providing the kind of advanced design that power producers want. Basic engineering features include labyrinth steam seals throughout, removable external glands, high chrome alloy steel buckets, and a time-proved governing system.

Engineered to Save Installation Costs

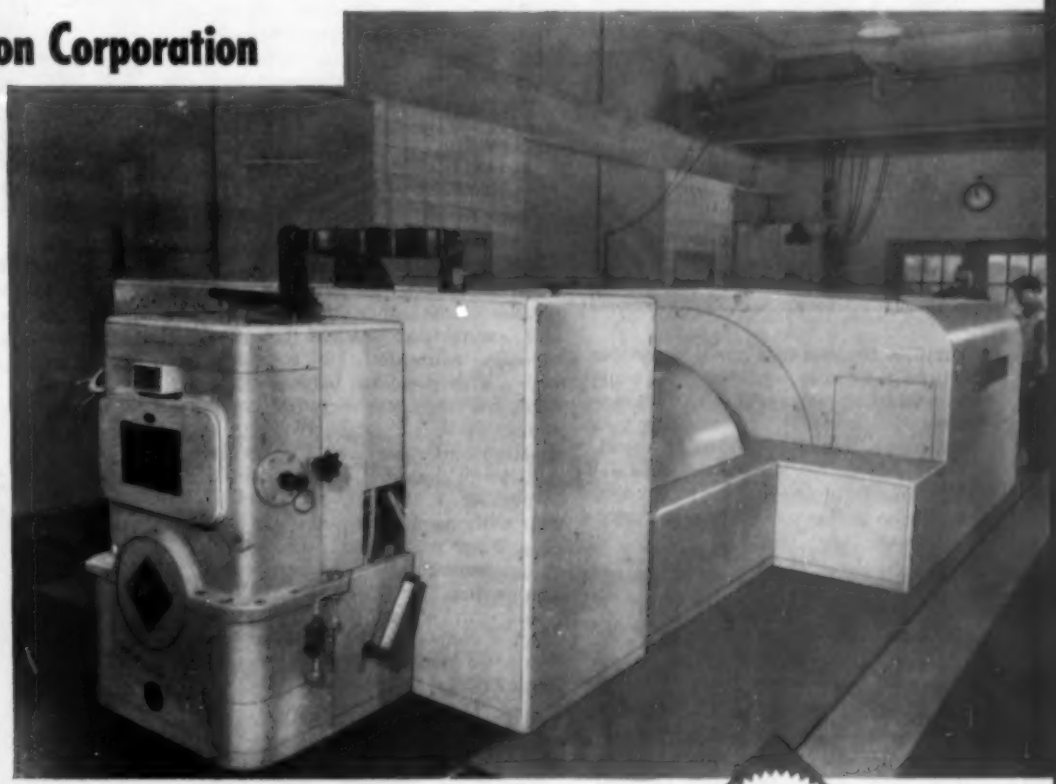
Particular care has been taken to promote ease of installation. Oil piping is above the floor line, eliminating need for trenches in the foundation. Generator gas coolers are located above the floor, eliminating ductwork through the foundation. Much of the work formerly done in the field is now performed in the factory. As a result, both turbine and generator can be shipped assembled ready for immediate installation.

For a detailed story on the advantages you can obtain with Allis-Chalmers steam turbine generating units, call your nearby A-C office, or write Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wisconsin, for Bulletin 03B7654. A-4968

At Marathon Corporation

ROTHSCHILD, WISCONSIN

4000-kw WA-Series unit produces power at 2400/4160 volts as a by-product of approximately 100,000 lb per hour of process steam. Steam conditions at turbine: 600 psig, 825 F, with 40 psig exhaust.



CHALMERS

A-C ALLIS-CHALMERS

Circle 148 on READ-N-CIRCLE card for more data

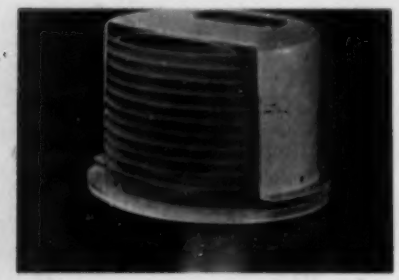
new products

. . . starts on page 10

more quickly than the old arrangement of adjusting blower vanes. Dampers also give a greater degree of accuracy in adjustment, resulting in higher combustion efficiency. CYCLOTHERM DIVISION, NATIONAL-U.S. RADIATOR CORPORATION.

708-Explosion suppression system uses nylon bellows

Device for sensing incipient explosions and suppressing them — all within less than 1/1000 second — uses a Du Pont nylon-resin bellows. System is based on the fact that, in the initial stages of any explosion or fire, pressure rise is not instantaneous but occurs over a period of perhaps three or four milliseconds. During this brief time, suppressants can effectively dampen the explosion before it does damage. Rise in pressure compresses a bellows diaphragm which



supplies current to a small detonator within a capsule containing the suppressant agent (generally bromochloromethane). When detonator goes off, suppressant is scattered as a mist. Unburned vapors around the expanding flame front are rendered inert and explosion is aborted. SIMMONDS AEROCESSORIES, INC.

709-Super cleaning for atmospheric air

Super cleaning of atmospheric air can now be done with industrial-type air filtration equipment. Ultra-filtration process employs conventional dust collectors of the tubular-cloth filter type. Filter bags are charged with a filter aid which precoats the filtering surfaces and provides a highly efficient matrix upon which fine particles of atmospheric dust and tarry matter are collected. One application of filter aid will last from two to

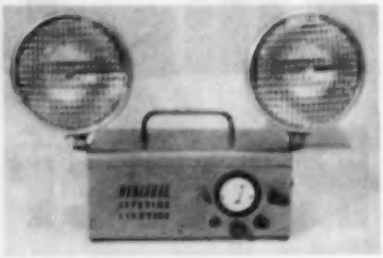
three years under normal conditions. A 720,000-cfm unit will reduce dust content of air from 5.21 to .04 mgs/1000 cu ft — a collection efficiency of over 99 percent. Maintenance is limited to removal and replacement of spent filter aid at intervals as infrequent as three years. WHEELABRATOR CORPORATION.

710-Absolute pressure gauge needs no barometric correction

Absolute pressure gauge is shipped ready to operate. Requires no installation service other than mounting and connecting. Gauges are individually calibrated by comparison with a high-precision barometrically-corrected standard mercury column gauge. Thus, all gauge readings are absolute and require no further correction for barometric pressure. Incorporates a built-in condensation trap with inspection glass and drain plug. Four scale ranges are offered, either individually or any two in combination. They can also be supplied with electrical contacts for vacuum control or for alarm systems. PRECISION THERMOMETER AND INSTRUMENT CO.

711-Lifetime emergency lighting

Emergency lighting unit, which uses the new hermetically sealed Dynaseal nickel-cadmium lifetime battery, will give many years of service without any maintenance. Includes an automatic charging feature which keeps the battery fully charged at all



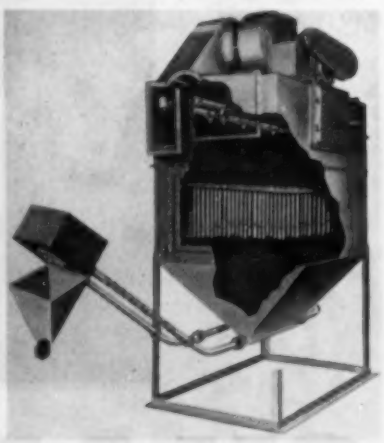
times. Turns on automatically when power fails and rapidly restores full battery energy once power is resumed. Battery requires no addition of liquid, can be recharged over 1000 times without loss of power, and can be stored indefinitely either charged or discharged. Lighting unit provides full illumination to complete battery discharge. Contains a charge-indicating meter and testing facilities on front panel. Available in hermetically sealed containers for use in hazardous atmospheres (never has to be opened for service). Unit weighs only 13½ pounds and is guaranteed for 10 years. Unit-mounted lamp assemblies and remote power supply units for multiple-lamp installations are available. DYNASEAL LIGHTING CORP.

FREE INFORMATION

For detailed free information on these products just circle the key numbers on the READ-N-CIRCLE card on page 83.

712-Dust scrubber removes microscopic solids

Dust control unit that removes microscopic solids, fumes, and odors from exhaust gases collects the dust



by hydro-compressing exhaust gases through a system of multiple tubes into a water chamber. Violent water

DE LAVAL
OPPELLER PUMPS

last longer... cut maintenance costs

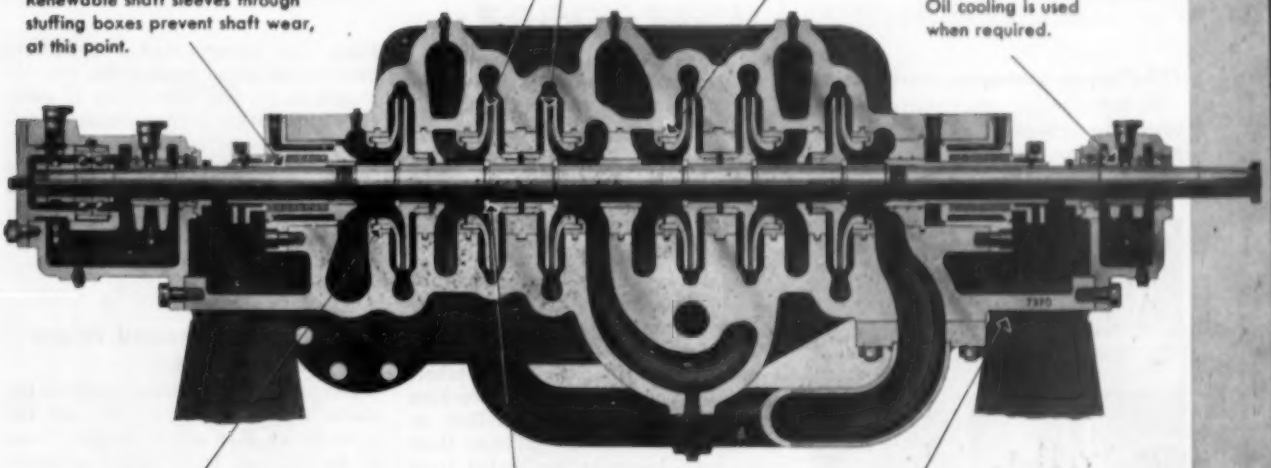
Stages are arranged to reduce differential pressures between stages. This insures permanent sealing at the casing-joint and at interstage diaphragms.

Pairs of back-to-back impellers balance axial thrust. One-purpose thrust bearing carries no radial load, maintains axial alignment.

Labyrinth wearing rings permit safe clearances and reduce wear.

All bearings are ring-oiled, sealed against contamination by water or dust. Oil cooling is used when required.

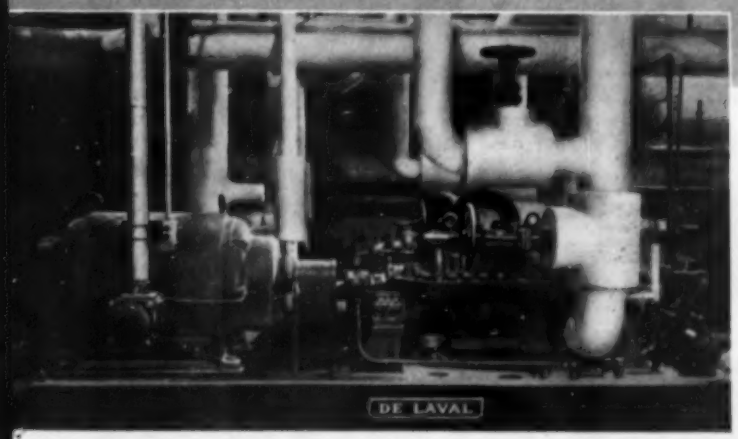
Renewable shaft sleeves through stuffing boxes prevent shaft wear, at this point.



Threaded impeller wearing rings make replacement easy without heating or damage to impellers.

Individual impeller mountings, with split locating rings, make interstage shaft sleeves unnecessary. Impellers can't shift with shaft expansion and contraction.

Casing support insures coupling alignment at any operating temperature.



Here are two De Laval 6-stage Oppeller Pumps used for boiler feed service in an industrial installation.

The design features above show clearly why De Laval Oppeller Pumps stay on the line longer and cost less to maintain. These pumps are used for boiler feed, hydraulic systems, descaling spray, mine dewatering, refinery oil pumping and similar services.

De Laval Oppeller Pumps are available in sizes from 2 to 4 inches and 2 to 8 stages; capacities to 1000 gpm, pressures to 1200 psig and temperatures to 350°F.

DE LAVAL *Oppeller Pumps*

DE LAVAL STEAM TURBINE COMPANY

857 Nottingham Way, Trenton 2, New Jersey

0L3B6

Circle 133 on READ-N-CIRCLE card for more data

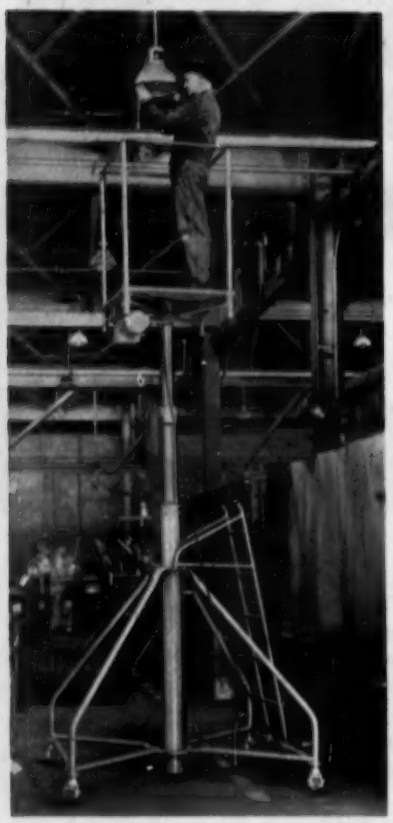
new products

. . . starts on page 10

agitation that is set up causes secondary pressure turbulence and additional scrubbing action in the tube chamber. Available for capacities ranging between 500 and 40,000 cfm. Sludge can be removed constantly or intermittently by manual, hydraulic, or mechanical means. Efficiencies up to 99 percent have been obtained with dust loadings at 5 grains/cu ft, and up to 70 percent with the material below 5-micron particle size. THE JOHNSON-MARCH CORPORATION.

713-Plug-in one-man work tower

Hydro-electric elevating work tower for one-man use can be plugged into any 110-volt ac outlet. Hydraulic pump powered by a single-



phase electric motor raises work platform from 7 to 17 feet above the floor in 25 seconds. Working capacity is 400 pounds. Comes with 50 feet of heavy-duty extension cable so that work can be carried out along 100-foot strip before moving to another outlet. Elevation is controlled by a foot button and hydraulic release valve on the platform. Towers are equipped with swiveling casters. Positive safety brakes act on both wheels and swivels. Also available in battery- and hand-operated models. SAFWAY STEEL PRODUCTS, INC.

FREE INFORMATION

For detailed free information on these products just circle the key numbers on the READ-N-CIRCLE card on page 83.

714-Roller increases drive-belt life, stops slip

Rapid wear of belts caused by rubbing on fork guides is eliminated by a new belt-guide roller. Roller not only increases belt life, but also prevents belt slip. Roller requires lubrication only once every 20,000 working hours. Can be easily installed on belt forks already in service. Both roller and bearings are sealed from dust and fly. SKF INDUSTRIES, INC.

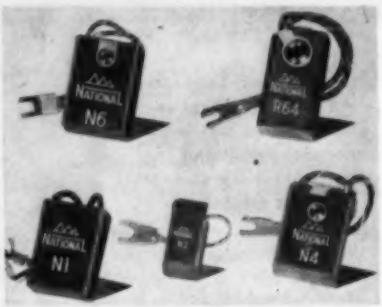
715-Pull-type air cylinder

Clevis-mounting pull-type air cylinders that provide powered effort toward the cylinder and spring return have a standard-length stroke of 1½ inches. Longer-stroke cylinders are also available. Ram extension is optional. Shorter return springs may be used to permit shortened ram extensions if necessary. Cylinder has

clevis mounting for use in off-line applications or where movement in an arc is required. Will readily pull through the length of its 20- to 160-degree swing. Power factors from 1.76 to 7.07 are available. AIR-MITE DEVICES, INC.

716-Better brushes last longer

Complete series of new carbon brush grades will fit the complete range of industrial motor and generator applications. They properly correlate longest brush life with highest degree of commutating ability. Five grades are available to re-



place the former metal-graphite brushes on some equipment, provide longer brush life with Class H (silicone) insulation, accommodate dc excitation rings for newer types of high-speed turbogenerators, and provide a new general-purpose type of industrial brush. NATIONAL CARBON COMPANY, DIVISION OF UNION CARBIDE AND CARBON CORPORATION.

717-German air-cooled diesels available here

Deutz air-cooled diesel engines include 1-, 2-, 3-, 4-, 6-, 8-, and 12-cylinder engines which develop from 15 to 150 hp. Two- to six-cylinder

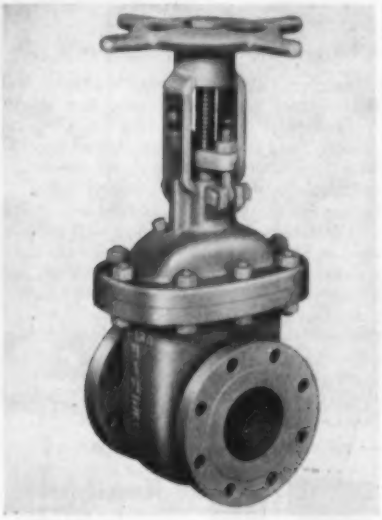
units have inline design. Units from 8 to 12 cylinders are V-type. Engine is cooled by an axial-flow blower. Engine temperatures are indicated by a remote-reading thermometer whose thermal feeler is accommodated in the

Circle 133 on READ-N-CIRCLE card for more data

air duct on the cylinder head between injector and glow plug. Lubrication is affected by a gear-type oil pump driven from the front end crankshaft gear. Adjustable oil nozzle screwed into the exhaust valve rockers permits flow of small quantity of oil to exhaust-valve stems for direct lubrication. Inlet-valve stems are lubricated by splash oil. All models have Bosch-type injection system. DIESEL ENERGY CORPORATION.

718-Gate valve is tight both ways

New gate valve provides impenetrable line shutoff, both on the upstream and downstream sides of the wedge. Besides precision metal-to-metal contact of wedge and valve-body seats, valve incorporates a pair of Teflon packing seals which press



dead-tight against the wedge, forming an impassable seal. Stainless-steel locking rings and seats make the valve impervious to corrosive fluids in the line. Replaceable stainless-steel seat is lightly welded into body to insure against leak-through. HAMER VALVES, INC.

719-Level indicator resists corrosion

Accurate indication of liquid level is now possible with corrosion-resistant indicator. Changes in liquid level cause a foam-plastic float to move up or down a marine-bronze stem. As the float passes preselected points, hermetically sealed switches are actuated to operate indicating or warning lights. Pumps or other power-driven equipment can be started or stopped automatically. Head assembly is a standard pipe

(more new products on page 94)

TO KEEP COSTS DOWN

KEEP PRODUCTION UP WITH

MANZEL

FORCE FEED LUBRICATION

Pressure Application — Exact Amounts — Accurately Timed

Manzel Force Feed Lubricators insure efficient machinery operation by lubricating automatically. No stops for hand oiling — or because of breakdowns caused by faulty lubrication. They

quickly pay for themselves through savings in down time, labor and lubricants.

These sturdy, dependable lubricators can be installed on new or existing equipment. Write for details.

Professionally qualified engineering representatives throughout the country.

Manzel

DIVISION OF

HOUDAILLE-HERSHEY CORP.

320 BABCOCK ST., BUFFALO 10, N. Y.

Circle 122 on READ-N-CIRCLE card for more data

new bulletins

. . . just circle key numbers on READ-N-CIRCLE card on page 83

400-Transmit differential pressure

Linear, force-balance instrument for pneumatically transmitting large pressure difference measurements is described in Bulletin MSP-130. Bulletin also contains dimensional drawings and installation data for a typical transmitter. Four pages. HAGAN CORPORATION.

401-Speed control selector guide

Formulas and selection guides to determine the proper variable-speed transmission for your application are contained in Bulletin 65. Also includes dimensional installation drawings for eight types of transmissions. Sections devoted to accessory controls include complete line of automatic and remote control devices. Twenty-six pages. LEWELLEN MANUFACTURING COMPANY.

402-Heating with hot water?

Bulletin 923 contains an easy-to-understand discussion of the problems relevant to industrial hot-water heating. Schematic diagrams of typical closed and open storage-type hot-water systems are included. Presented in question-and-answer form, it discusses pertinent questions on all phases of hot-water heating. Fourteen pages. FRED H. SCHAUB ENGINEERING CO.

403-Pump large volumes quietly

Centrifugal pumps made especially for circulating large water volumes where smooth and silent operation is essential are discussed in Bulletin HC-855. Contains performance capacity charts for 12 different pumps. Also included are dimensional reference drawings for installation and foundation purposes. Four pages. BELL & GOSSETT COMPANY.

404-Rapid valve positioner

Electro-hydraulic actuator, developed to improve process control accuracy, reduce transient error, and generally reduce difficulty of control, is described in Catalog 22. Describes how actuator reaps full benefits from modern, fast, accurate electronic control systems. Explains why electro-hydraulic system actuators cannot be backdriven by the unbalanced forces within the valve body. WEIGHING COMPONENTS, INC.

405-Are you venting tanks properly?

Principles of venting flammable liquid-storage and process tanks for effective operation, fire protection, and low-cost maintenance are described in this bulletin. Separate, illustrated sections are devoted to conservation-type, and non-conservation-type venting. Sections are also devoted to flame arrester units, protective devices for fuel tanks on industrial equipment, and protection in loading and unloading tank cars. Twelve pages. THE PROTECTOSEAL COMPANY.

406-High-pressure barrel-type pump

Recent technological improvements in barrel-type pumps and cutaway sectional drawings are included in Bulletin 08 B 7899. Bulletin discusses provision of balanced double-volute passages to eliminate ratio thrust on the rotor. Center discharge, with back-to-back arrangements of pump stages provides hydraulic axial balance and eliminates need for balancing drum. Complete line of pumps is available in ranges from 1200 to 3600 psig, and in capacities from 300 to 3500 gpm. Sixteen pages. ALLIS-CHALMERS MANUFACTURING COMPANY.

407-Stop those pump-seal leaks

Important features of unitary mechanical seals are described in Bulletin AD-151. Seals are designed for use on rotary shafts of boiler feed pumps, chemical pumps, oil refinery pumps, and digestor circulating pumps. Bulletin contains construction details of unitary mechanical seal, as well as recommendations for type of service. Specification form and installation sketch is also provided for obtaining additional special information. Twelve pages. THE GARLOCK PACKING COMPANY.

408-How to select thermocouples

A comprehensive discussion of theory and uses of thermocouples is contained in Bulletins 1601, 2, 3, and 4. Thermocouple circuits and metals, immersion length, protecting tube, junctions, extension leads, and terminal connectors are discussed in detail. Recommended operating temperatures and resistance tables are included for most commonly-used thermocouples. Dimensional drawings show installation data for the proper measurement of liquid gas, and surface temperatures. Fourteen pages. REVERE CORPORATION OF AMERICA.

409-V-belt engineering standards

"Engineering Standards Multiple V-Belt Drive" manual contains the latest technological improvements in V-belt design. Data in the manual, based on the latest engineering opinion and research, indicate the proper sheaves and belts to be used for attaining optimum efficiency and economy. Basic horsepower formulas used in obtaining the new ratings are also shown. New manual is the result of the cooperative efforts of 25 well-known manufacturing companies. Available for the first time are horsepower ratings for belt speeds up to 6000 ft/min. Price: $1.00 per copy. Twenty-four pages. MULTIPLE V-BELT DRIVE & MECHANICAL POWER TRANSMISSION ASSOCIATION.

410-Steam-turbine selection curves

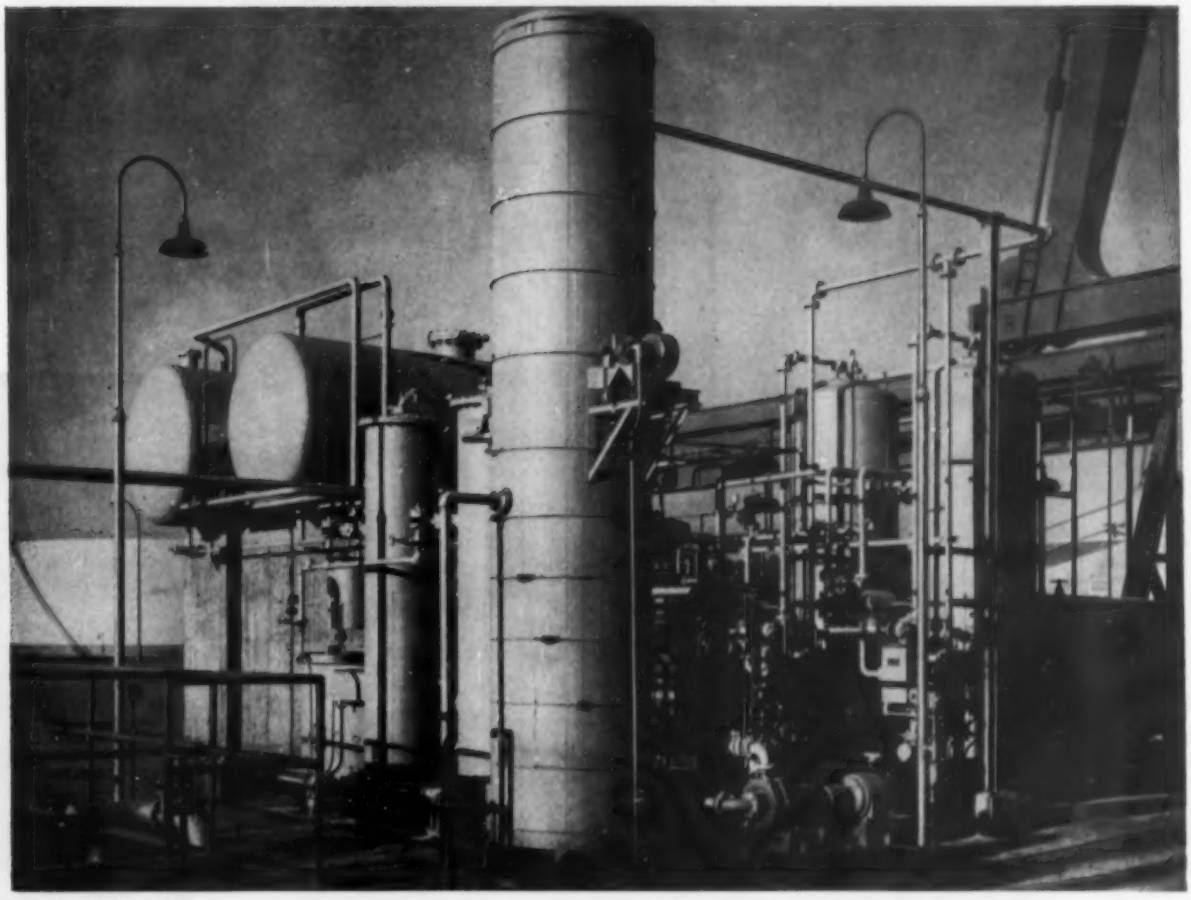
Horsepower selection curves for the complete line of horizontal and vertical steam turbines are contained in Bulletin 500. Includes overall installation dimensions for vertical and horizontal DH steam turbines. Typical installations of additional optional accessories are also shown. Sixteen pages. DEAN HILL PUMP COMPANY.

411-Muscles for industry

Pneumatic power positioners to provide muscles for thousands of exacting control loads in every industry are described in Bulletin TP-MFI. Ideally suited

(More new bulletins on page 24)

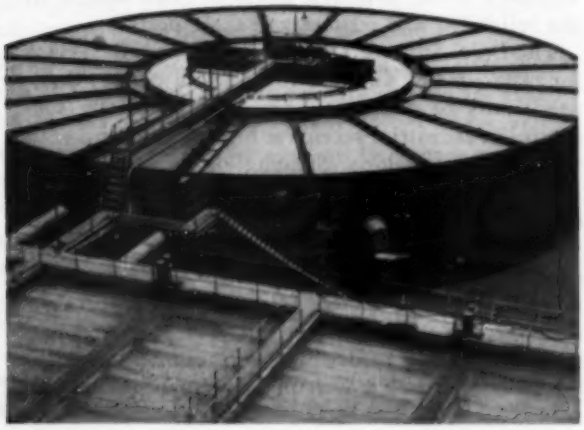
3 SOLUTIONS FOR YOUR BOILER FEEDWATER PROBLEMS



1. CATEXER® and ANEXER® Demineralizing Plants: Pioneered by INFILCO, these demineralizing and silica removal plants, operating on the ion exchange principle, provide the low solids and low silica content water so necessary to the satisfactory operation of very high pressure boilers and turbines. They afford five major advantages: (1) improved make-up quality, (2) adequate make-up supply regardless of station electrical load, (3) reduced overall operating costs, (4) lowered maintenance costs and (5) lower labor costs.

---

2. ACCELATOR® Treating Plants: The "ACCELATOR" treating plant with appropriate chemical feeding equipment and auxiliaries affords in many cases a satisfactory means of treating feedwater for low pressure boilers or for pretreating feedwater for higher pressure boilers. They have a proven record of flexibility, ease of operation and chemical economy.



3. Hot Process Softeners: For the intermediate range of boiler pressures, INFILCO Hot Process Softeners with Hot Process Zeolite Units provide low alkalinity, low hardness and low silica content feedwater at moderate chemical cost.

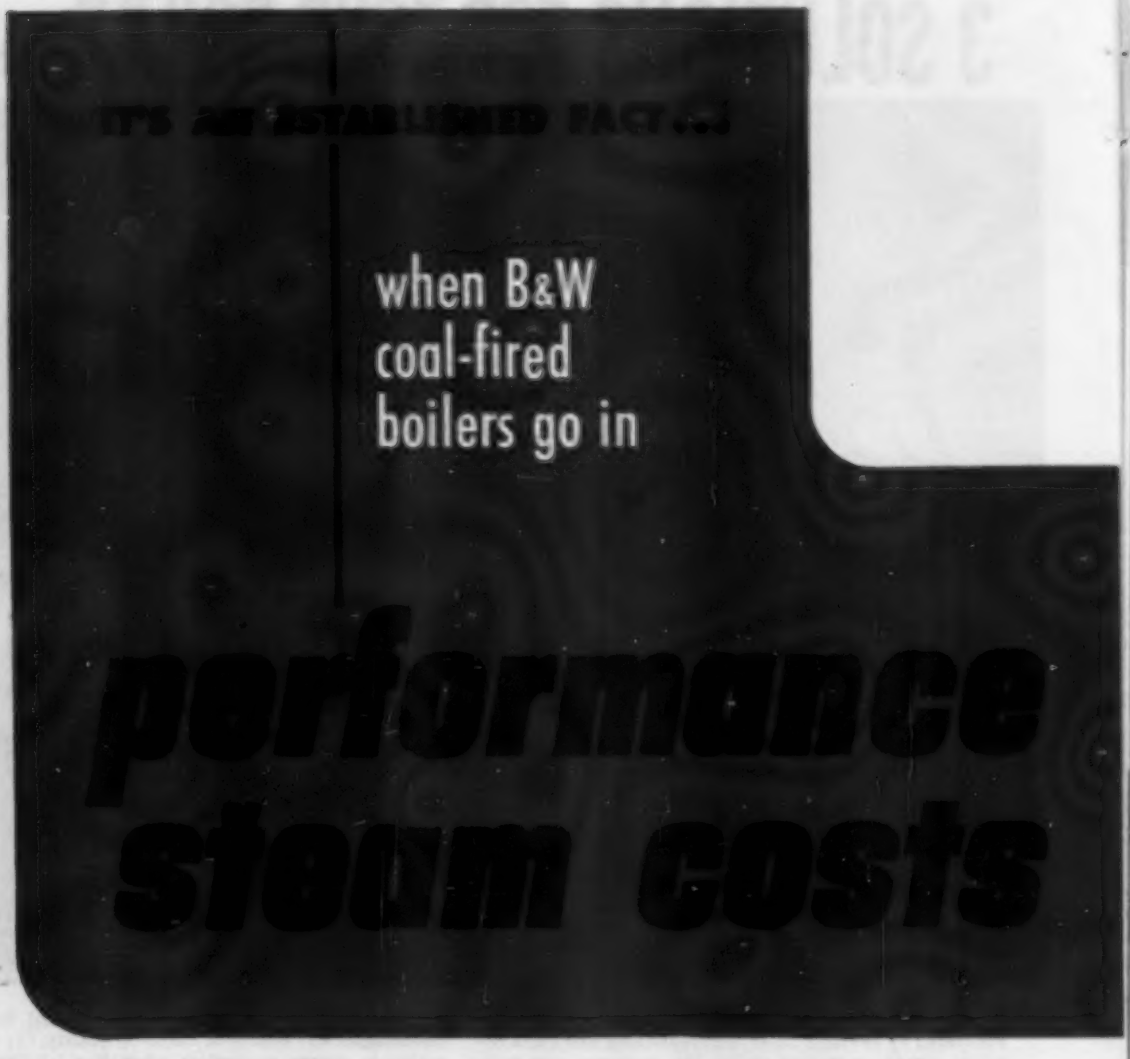
Engineering Experience: Complete engineering know-how plus many years of experience has made INFILCO the leader in its field. Our field engineers are available to suggest practical solutions for your feedwater problems. Write today for complete information to

INFILCO INC.
911 South Campbell Ave.
Tucson, Arizona
Field offices in principal cities in North America

INFILCO

The one company offering engineered equipment for all types of water and waste processing—coagulation, precipitation, sedimentation, flotation, filtration, ion exchange and biological treatment.

Circle 144 on READ-N-CIRCLE card for more data



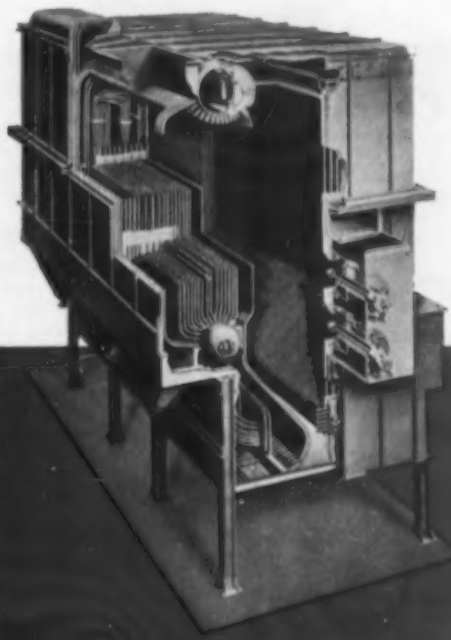
In plant after plant where B&W Boilers with modern auxiliaries have replaced other units, substantial overall savings have been reported as the combined result of space-saving, lower fuel costs through more complete fuel combustion, greater efficiency, less coal and ash handling, and elimination of fly-ash problems. Almost invariably with this reduction in fuel, operating labor and maintenance costs goes an increase in steam capacity. And where demand varies widely, B&W Units provide a constant and reliable steam supply with quick response to rapid and heavy load swings.

A leading choice of industrial users for a broad variety of applications, B&W Integral-Furnace Boilers with steam capacities to 200,000 lb per hr have been providing maximum capacity in small space, high fuel economy, smokeless combustion and fast steaming since their introduction in 1933. The well over 200,000,000 lb per hr total capacity now in service or on order, representing all types and firing methods, is the strongest possible endorsement of the reliability and economy of these units.

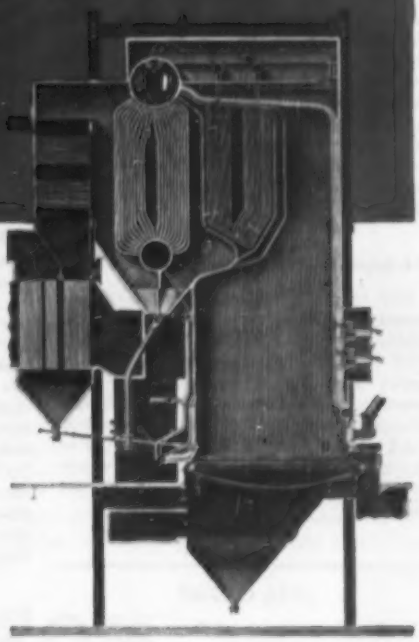
The B&W Stirling Two-Drum Boiler is in service for capacities to 460,000 lb of steam per hr. Coal-fired units of this type have been especially successful in industrial service at high ratings and with wide load variations. Spacing of tubes in boiler bank and single-pass gas flow contribute to excellence in steaming and freedom from ash fouling.

If space-saving is an important factor . . . If your fuel and maintenance costs are excessive . . . If fly-ash is becoming more and more of a problem . . . there's a cost-saving B&W Boiler to suit your precise needs. Check with B&W before planning your next installation. The Babcock & Wilcox Company, Boiler Division, 161 East 42nd Street, New York 17, N. Y.

From an FF installation for as low as 4600 lb per hr to the FH's 200,000 lb per hr, and in between, B&W has provided a choice of coal-fired Integral-Furnace Boilers to meet an unusual range of steam requirements.



goes up go down



A large number of B&W Stirling 2-Drum Boilers in capacities to 460,000 lb per hr are providing exceptionally satisfactory service in a variety of industrial installations.

Typical comments quoted below indicate the performance pattern set by B&W coal-fired boilers in service in industrial plants of all types across the country.

"Boiler response is excellent . . . steam pressure is steady and continuous . . . previously serious fly-ash problem has been substantially reduced." *—Chemical Plant Chief Engineer*

". . . I am confident that we could not have made a wiser choice . . ." *—Processing Company Plant Engineer*

". . . benefits include reduction of labor in coal and ash handling, a cleaner boiler room, adequate smoke control and improved performance records . . ."

—Tobacco Company Chief Engineer

". . . and it's saving us 20 tons of coal every day."

—Paper Mill Superintendent

"We're not selling B&W Boilers, but we can't recommend them too highly . . ." *—Processing Company Plant Engineer*

BABCOCK & WILCOX

BOILER DIVISION

G-741

Circle 103 on READ-N-CIRCLE card for more data

new bulletins

. . . starts on page 20

for automation, positioners are used for applications where thrust and accuracy requirements are severe. They are used to control flow, pressure, temperature, or level, as well as to operate valves, gates or dampers. Positioning is normally linear with signal pressure, but any desired relationship may be obtained by changing the shape of the cam. Twenty pages. HAGAN CORPORATION.

412-Motor-generator buying guide

Illustrated booklet presents detailed information on the complete line of motors from 1/20 hp to 2500 hp, and generators from ½ kw to 2000 kw. Includes engineering data on dripproof, splashproof, weather protected, totally enclosed, and explosionproof motors for single phase, polyphase, and dc opeation. MARATHON ELECTRIC MANUFACTURING CORPORATION.

413-Lubrication selection chart

Explanation of the basis of molybdenum disulfide lubricity is contained in Bulletin 103-A. Lubricant properties include a natural affinity for adherence to metal surfaces, resistance to pressures beyond the yield point of metal, and thermal and chemical stability. Seventeen types of this lubricant are featured. Explanations, diagrams, and discussion of the importance of this compound in extreme bearing pressure lubricants for high and low temperature applications are given. Four pages. THE ALPHA MOLYKOTE CORPORATION.

414-Dry-type fluid cooler data

Dry-type fluid coolers, units developed especially for economical liquid or gas cooling, are described in illustrated Bulletin S-395. Descriptions of actual fluid cooler applications, including gas compressor intercooling, jacket water, and lubricating oil cooling are contained in the bulletin. Also discussed is the use of dry-type fluid coolers in areas where water is scarce. Eight pages. THE TRANE COMPANY.

FREE COPIES

For free copies of these handbooks, bulletins, and catalogs just circle the key numbers on the READ-N-CIRCLE card on page 83.

415-Electric products buying guide

Abridged Bulletin 56 contains complete, condensed list of electrical equipment for all industrial needs. Up-to-date price list is also included for conduit fittings, switch controls, plug and receptacles, lighting equipment, turbines, and turbogenerators. Eighty pages. THE PYLE-NATIONAL COMPANY.

416-Flexible joints for piping

Industrial applications highlighting the versatility and economy of the ball joint are described in illustrated Bulletin 215-B. Flexible ball, swing, swivel, and revolving movable joints are included for use in piping for power, process, heating, chemical, construction, and hydraulic service. Fifteen different sizes are illustrated from ¼ to 12 inches. One section is devoted to solving piping problems involving expansion-contraction, alignment and very slow rotation. Also included are do's and don'ts of maintenance and repair procedures. Twenty pages. BARCO MANUFACTURING CO.

417-More profit with turbodiesels

What is a turbodiesel? The answer to this question along with the answers to greater fuel economy, more power without increased size, and reduced engine waste per horsepower are contained in Bulletin 12009. Four-color bulletin contains illustrations and easy-to-understand description of the operation of turbochargers on diesel engines. Also contains specifications and performance curves for four industrial diesel engines. Comparisons of fuel economy, horsepower, and reduced weight for naturally aspirated, supercharged, and turbodiesel engines are shown. Sixteen pages. CUMMINS ENGINE COMPANY, INC.

418-Tough pumping jobs are easy

How patented construction enables this pump to handle liquids containing air, gases, or solids is explained in Bulletin 7325-9-E5. Single-stage, vertically-split centrifugal pumps will handle foamy solutions containing up to 50-percent entrained air or gases. Available in sizes from 4 to 12 inches, and for capacities from 200 to 7000 gpm. Also contains dimentional drawings for installation of all pump sizes. Six pages. INGERSOLL-RAND.

419-Vibration encyclopedia

This nine-chapter booklet discusses meaning of vibration terms, vibration-measuring instruments, procedures, typical examples, and interpretation of results. Describes decibel conversion tables, vibration meters, and vibration analyzer equipment. A short section is devoted to the human response to mechanical vibration. Sixty-four pages. GENERAL RADIO COMPANY.

420-Made for hazardous installations

Bulletin 505 describes features that make these electric motors suitable for installations in hazardous locations. They can be supplied in sizes from ½ to 40 hp for either normal or high-torque requirements. Tables of ratings and principal dimensions for these totally-enclosed, fan-cooled motors are also included. Six pages. ROBBINS & MYERS, INC.

421-General-purpose valve manual

Gate, globe, and angle valves in sizes from ¼ through 2 inches are contained in Bulletin F-9, supplement 1. Also includes pressure-temperature rating chart for carbon and alloy steel valves. Dimensional-sectional views of 11 available valve configurations are given. Includes price list for complete line of valves. An excellent manual for the engineer faced with a valve or piping problem. Thirty-two pages. HENRY VOGT MACHINE CO.

422-Centralized lubrication systems

How centralized lubrication systems help you maintain peak production and reduce operating costs is explained in Bulletin 26-R. System-lubrication reduces personal injury hazards, delivers exact amount of lubricant to each bearing, eliminates waste, prevents contamination, and insures positive lubrication of each bearing. Three-color illustrations describe operation of the positive-displacement lubricant-measuring valve. Twenty pages. THE FARVAL CORPORATION.

423-Air compressor selection guide

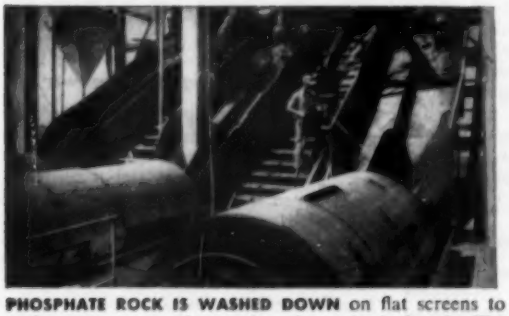
Bulletin 36 is a comprehensive text for selecting the proper air compressor for your job. Includes a detailed engineering section and tables of computations to insure correct installation. Also contains descriptions, specifications, dimensional engineering drawings, and representative photographs of the complete line of single- and two-stage compressors. Other sections include information on continuous operating compressors, accessories, and controls. Forty-four pages. BRUNNER MANUFACTRING COMPANY.

424-Overhead materials handling

Engineering and application data on overhead materials handling equipment is contained in Bulletin 2008-L. A thorough analysis of stresses in a number of types of overhead tracks is discussed. Track switches, carriers, tractors, cranes, transfer cranes, gantry cranes, automatic

LOW INITIAL COST and widespread reputation for dependability were the big reasons why The American Agricultural Chemical Company selected a Worthington vertical turbine pump. They use it to maintain proper storage level of their water supply lake in dry seasons.

Worthington vertical turbine pump supplements lake water in dry season



PHOSPHATE ROCK IS WASHED DOWN on flat screens to underwater trommels at American Agricultural. The Worthington vertical turbine pump ensures an adequate supply of water during the dry periods when the impounded rain water level in their supply lake gets low.

In Pierce, Florida, The American Agricultural Chemical Company mines phosphate rock for processing into fertilizers and other chemicals.

In washer operations at their South Pierce Mine, American Agricultural uses over 2,500,000 gallons of recirculated water every working day. All the water for this vast operation comes from various mined-out cuts and lakes. During the rainy season, water is impounded in these areas for use in the dry season. In abnormally dry seasons, however, American Agricultural supplements its water storage by using a modern Worthington vertical turbine pump.

Like American Agricultural, more and more industrial plants are turning to Worthington vertical turbine pumps as the most economical means of supplying water. Users everywhere praise the low maintenance and power costs of these dependable pumps.

Write today for our Vertical Turbine Pump Bulletin W-450-B-39. Worthington Corporation, Vertical Turbine Pump Division, Harrison, New Jersey.

432

WORTHINGTON

THE WORLD'S BROADEST LINE ASSURES YOU THE RIGHT PUMP FOR EVERY JOB

CENTRIFUGAL • ROTARY • STEAM • POWER • VERTICAL TURBINE

CONSERVE GROUND WATER—IT IS A VALUABLE RESOURCE

Circle 134 on READ-N-CIRCLE card for more data

new bulletins

. . . starts on page 20

handling systems, interlocks, discharge points, and electrification are also described. Twelve pages. CLEVELAND TRAM-RAIL DIVISION, THE CLEVELAND CRANE & ENGINEERING CO.

425-Dependable desiccant dryers

Bulletin D-100 explains the principal variables of dryer design and the effects of temperature and pressure on dryer size for specific applications. Detailed flow diagrams and cutaway sections clearly show the operation of nine basic types of desiccant dryers. Handy engineering reference data section includes seven charts and tables related to desiccants, pressure drop, gas velocity, and temperature. Forty pages. THE C. M. KEMP MANUFACTURING COMPANY.

426-Electric motor buying guide

Well-illustrated, four-color Bulletin N-100-R describes construction and utility features of these motors. Cutaway illustrations depict construction features in full detail, show flow pattern of cooling air. Types of enclosures, flange-mountings, and dimensional drawings are also included for ease-of-installation. An excellent, well-illustrated bulletin for engineers concerned with purchasing electric motors. Sixteen pages. HOWELL ELECTRIC MOTORS COMPANY.

427-Power connectors technical data

Bulletin 38-E contains condensation of pertinent technical information on the use of power connectors. Included are 20 separate resistance and current carrying capacity tables for many materials and connector configurations. Formulas are shown that determine forces due to short-circuit current. Comparative linear expansion tables for aluminum, copper, and steels, are also included. Thirty-six pages. DELTA-STAR ELECTRIC DIVISION, H. K. PORTER COMPANY, INC.

428-Which oil filters to buy?

Filter recommendations for all makes of commercial and industrial, gasoline and diesel engines is contained in Bulletin DL-54. Three-color illustrations show advantages and effects of using supported and nonsupported filter cartridges. Flow diagram demonstrates operation of typical filter. Sixteen pages. THE DELUXE PRODUCTS CORPORATION.

429-Aluminum skin-wall construction

Well-illustrated, informative Bulletin BAPW56 elaborates on the 11 advantages of using aluminum projected windows in your building. Typical construction details for installation on concrete, brick, and tile buildings are shown. Ease-of-maintenance, modern appearance, dust- and draft-free closure are features obtained by using aluminum projected windows. Twenty-eight pages. THE WILLIAM BAYLEY COMPANY.

430-Space-saving instrumentation

Five-inch vertical scales that are easy to read, uniformly illuminated, and easily mounted on modern boiler console-type control panels are described in Bulletin 806. All standard draft ranges, pressures up to 100 psi, and temperatures to 1000 F may be measured directly with the V-5 gauges. The compact integral-unit gauges may be mounted with eight gauges side-by-side. Each unit can be easily removed and replaced without disturbing others. Twelve pages. REPUBLIC FLOW METERS COMPANY.

431-Pressed-on hose assemblies

Bulletin 100 contains flow charts, nomographs, thread information, and methods for computing length of hose assemblies. It also presents a wide range of factory-assembled high-, medium-, and low-pressure hose assemblies for hydraulic, suction, and general applications. ANCHOR COUPLING CO. INC.

432-Meter your fluids with accuracy

Bulletin OG-409 describes entire line of all-bronze fluid flow meters. Available in two-, three-, and four-inch sizes, meters are recommended for metering alcohols, brine, water, ketones, organic esters, and mild acids. Also describes complete line of accessories including remote registration systems, strainers, air eliminators, register extensions, temperature compensators, and impulse contractors. Dimensional drawings, maximum capacity, and working pressure ranges are included. Eight pages. ROCKWELL MANUFACTURING COMPANY.

433-Hardness data card

Hardness conversion chart shows the approximate relation between hardness values obtained by various testing systems and the tensile strength of carbon and alloy steels. Hardness systems covered in Bulletin TDC-183 are Brinell, Monotron, Vickers, and Rockwell. THE BABCOCK & WILCOX COMPANY.

434-Control your engine horsepower

Applications and problems of the four general types of engine governors are explained in Bulletin D-146. Full line of engine governors is available for constant speed, full range, automotive, and overspeed-trip type operation. Also contained is graphic example of accuracy to which engines can be regulated by precision flyball governors. Eight pages. THE PIERCE GOVERNOR COMPANY, INC.

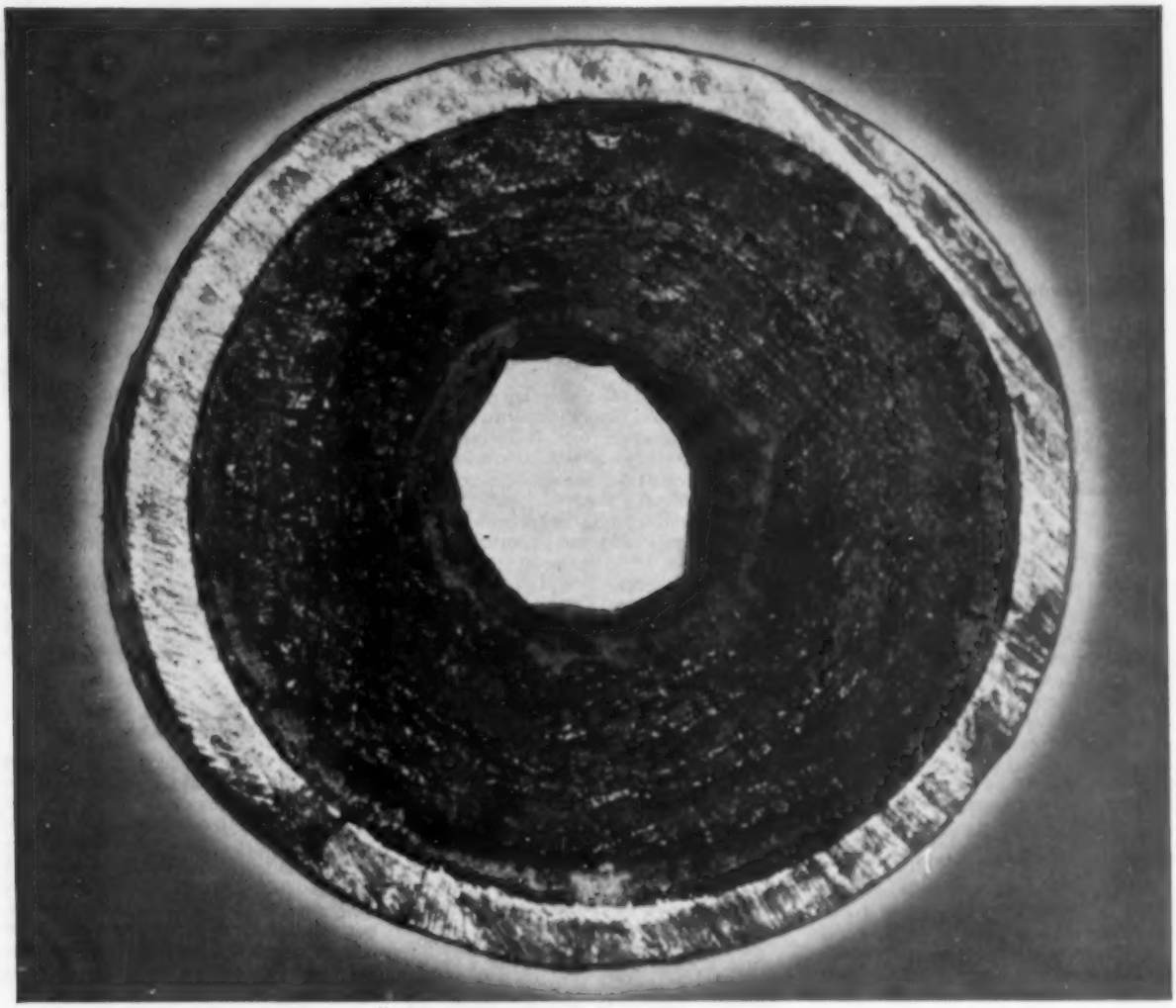
FREE COPIES

For free copies of these handbooks, bulletins, and catalogs just circle the key numbers on the READ-N-CIRCLE card on page 83.

435-Abrasive resistant pipe

Construction features and recommended applications of Ashcolite abrasive resistant pipe and couplings for pneumatic and hydraulic materials handling systems are described in Bulletin Wa. Dimensional schematic drawings are also included describing the application of

ERNST
HIGH PRESSURE
GLASSES
and GASKETS
All sizes to fit your gages and valves
MAGNIFYING RED LINE
FIG. 22 SERIES 750
FIG. 21 LIP-MOLD
STATE YOUR REQUIREMENTS
All shipments from stock.
Send for Catalog
ERNST WATER COLUMN & GAGE CO.
Livingston 6-1400 LIVINGSTON, N. J.
Circle 120 on READ-N-CIRCLE card



END OF THE LINE

SCALE—layer upon layer of it—has reduced the inside diameter of this pipe to practically nothing. It's a common occurrence in some power plants, and the results are costly. The line must be taken out of service. That means production loss and expensive maintenance or replacement.

Scale, sludge, carry-over, and return-line corrosion are but a few of the problems that must be overcome to assure efficiency in boiler plant operation. In Dearborn's complete line of water conditioning products, there is the correct treatment to eliminate every water trouble—the properly balanced treatment to reduce unnecessary maintenance, avoid shutdowns, and protect valuable equipment.

Since 1887, Dearborn products have provided trouble-free water to users of steam in all types of industry. That's why, today, power engineers in leading industrial plants throughout the nation look to Dearborn for consultation and assistance in solving their water treating problems.

Dearborn®

...a leader in water conditioning and corrosion control

MAIL THE COUPON

Dearborn Chemical Company, Dept. INP
Merchandise Mart Plaza, Chicago 54, Ill.
Please send me complete information on Dearborn Water Conditioning.

Name.....*Title*.....
Company.....
Address.....
City.....*Zone*....*State*.....

Circle 143 on READ-N-CIRCLE card for more data

new bulletins

. . . starts on page 20

the full line of couplings, blind flanges, adapters, and special accessories. The Allen-Sherman-Hoff Co.

436-Tube bending made easy

Compact, crank operated, worm-gear device for easy, manual bending of instrument-conduit tubing is described in Bulletin 1141A12. Bends up to 180 degrees are possible in one continuous smooth operation without strain or fatigue. Each radius block has graduated markings to indicate degree of bend, plus an integral arrangement for easy, quick, clamping of the tube. Four pages. Tube & Hose Fittings Division, Parker Appliance Co.

437-Zero-oxygen deaerators

Fundamental principles of deaeration are reviewed in Bulletin 575. Three-color bulletin describes operating methods of deaerator, auxiliary heaters, surge tanks, and their effects on boiler operations. Cutaway illustrations show component parts of equipment in operation. Also shown are corrosion inhibitors, water-level controls, and boiler-feed pumps. Eight pages. Fred H. Schaub Engineering Company.

438-Heavy-duty exhaust fans

Complete data to aid selection of exhaust fans for all applications are included in Bulletin 6514. Included are delivery ratings at various static pressures, fan speed, motor horsepower, quietness rating, and maximum net weight for 45 different direct-drive fan units. Installation drawings that give basic dimensions for each size model are also included. Four pages. American Blower Corporation.

FREE COPIES

For free copies of these handbooks, bulletins, and catalogs just circle the key numbers on the READ-N-CIRCLE card on page 83.

439-Visible vane-type flowmeter

Visual inspection of the liquid or gas flow being measured is possible with the new flowmeter described in this bulletin. Describes how design features used in manufacture result in a rugged, dependable instrument. Two pages. Scully-Jones and Company.

440-Battery maintenance manual

Photographs, charts, tables, methods of repairs, maintenance, and salient points on theory of operation are contained in this manual. Also includes instructions covering repairs with regular or special tools; simplified testing methods including safety practices, acid handling precautions, and instructions on correct charging methods. Forty-eight pages. C & D Batteries, Inc.

441-What is xerography?

The answer to this question may be the answer to how you can save up to 1/3 of your reproduction costs. Bulletins, interoffice forms, reports, letters, invoices, and engineering drawings may be reproduced with 50 percent reduction and 150 percent enlargement. Bulletin explains how xerography works, plus example of how savings can be made using this equipment. Four pages. The Haloid Company.

442-Leakproof, quick-seal coupling

How quick-seal, straight-through couplings are constructed to provide a versatile hose connector is contained in this bulletin. Couplings feature tough V-type, Buna-N seals, fast action sleeve operation, and elimination of spillage upon uncoupling. All couplings incorporate 360 degree swivel action, thereby preventing hose kinking. Also included is a complete line of check-valve couplings, accessories, flexible metal hose, and precision bellows. Twenty pages. Titeflex, Inc.

443-Low-pressure heating data

Descriptive material and illustrations explain boiler construction features, describe flame pass, and discuss stoker firing. Bulletin SB-55 contains data and installation dimensions common to both automatic and hand-fired heating equipment. Construction details for pits to accommodate easy ash removal are also incorporated. Eight pages. Erie City Iron Works.

444-Instrument selection chart

How to select the proper temperature control instrument is explained in Bulletin G-20. Specifications, description of operation, plus methods of installing high-temperature safety alarms and high-temperature cutouts is also described. Both electric and pneumatic types are included, with operating temperature ranges from subzero to 1800 F. Four pages. Burling Instrument Co.

445-Power panels prevent problems

Factory fabricated and installed instrument panels and electrical controls are discussed in Bulletin 4178. Complicated control panels are factory assembled, wired, and tested before shipment. Bulletin illustrates typical assemblies of conventional- and graphic-type cubicles for power stations and municipalities, demineralization and electro-plating processes. Eight pages. The Permutit Company.

446-Lubricate at high temperatures

Descriptive material on the properties of Sun 844X high-temperature grease is contained in Bulletin 40. This high-melting-point, short-fibered grease compound resists oxidation at temperatures up to 250 F. Also includes time-temperature chart showing the life of Sun 844X at various operating temperatures. Sun Oil Company.

447-Portable heat where you want it

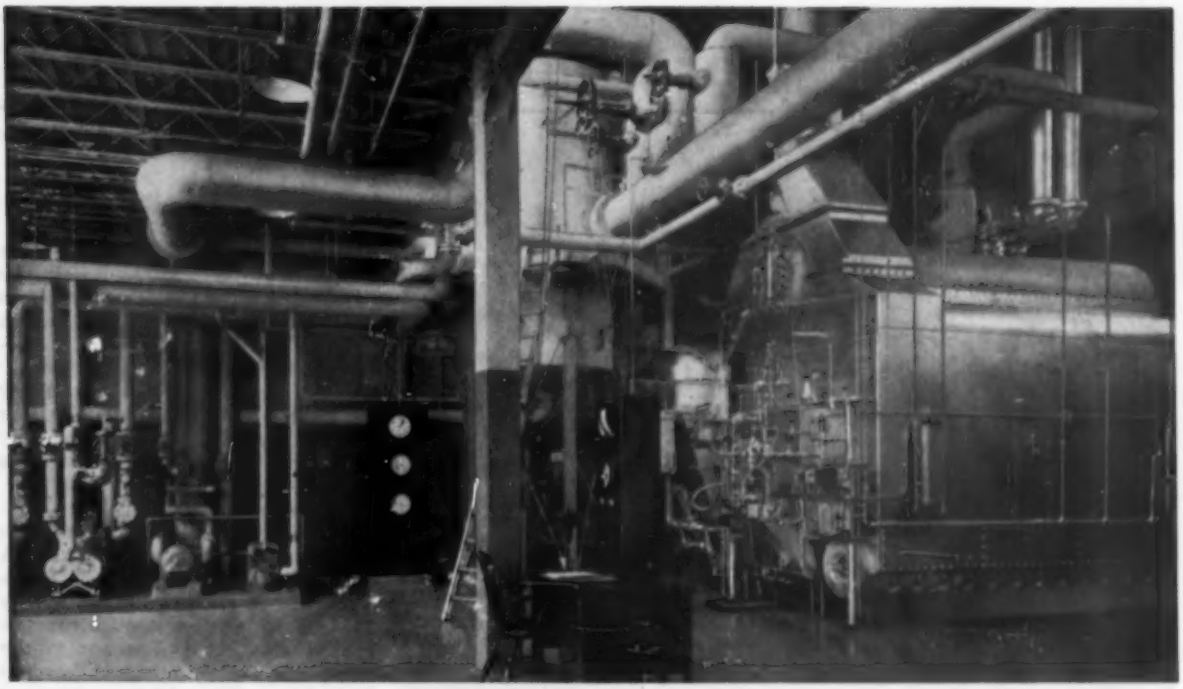
Portable heat machine that can be plugged in to any standard 110-volt, 60-cycle outlet to provide up to 189,000 Btu per hour is described in Bulletin LL-2220. Machine is fuel-oil-fired with blower fan to circulate heated air. It may be operated with or without vents, and up to 50 feet away from fuel tank. Circulating fan can be changed in five minutes to provide cool air circulation during warm weather. Six pages. Fageol Heat Machine Division, R. D. Fageol Co.

448-Wet chemical fire extinguishers

Features incorporated in new line of wet chemical portable fire extinguishers are explained in this bulletin. Brass containers are tin lined, permitting use of either clear water or antifreeze solution as charging liquid. Charging pressure of 100 psi permits charging extinguisher from normal plant-air supply system. Pressure gauge built into side of valve reveals readiness of extinguisher at all times. Walter Kidde & Company, Inc.

449-Magnetic variable-speed drive

Ways to improve operations in your plant through the use of ampli-speed drive are discussed in Bulletin 4400-PRD-229. Units are available in ranges from 15 to 95 hp for fans and pumps, and up to 75 hp for constant-torque loads. Three-color illustrations describe operating principles and show recommended installation procedures for direct-coupled and V-belt drives. Selection charts are also included for selecting correct equipment for intermittent- and constant-torque load. Four pages. Electric Machinery Mfg. Company.



Union packaged boilers exceed 80% in efficiency tests at University of Toledo

Job Report (UIW)—Not only do two Union Type MH Packaged Steam Generators provide space heat for 14 buildings on the University of Toledo's 170-acre campus, but they also take part in the educational process. Utilized for laboratory work by mechanical engineering students, these Union Steam Generators are reported to operate at "better than 80% efficiency."

Says University of Toledo, "We get 128 lbs. of steam per gallon of fuel oil as compared to 93 lbs. per gallon with the old boilers formerly used. The new plant, in operation since the fall of 1953, uses #6 oil in the winter and #5 in spring and fall. During the past year, 361,746 gallons were used, producing 46,180,000 lbs. of steam."

Users who have kept tabs on Union Packaged Boilers as carefully as University of Toledo, report like economies. From coast to coast, Union Type MH Steam Generators have proved their worth in chemical processing plants, pulp and paper mills, breweries, refineries, institutions, schools and hospitals, to name a few.

Completely shop-assembled in Erie, Pa. for delivery via rail or truck, Union Type MH Units are patterned after larger but similar field-erected Type H Boilers, originated by Union over 16 years ago. They can be equipped to handle multitudes of needs formerly requiring costly field erection and special engineering.

For example: Superheaters can be installed to meet total temperature requirements, while air heaters and economizers are readily supplied when needed.

Standard units are designed in 13 sizes from 10,000 to 40,000 lbs. of steam per hour at 250 psi, with higher pressures available for special applications.

The complete story on Union Type MH Steam Generators, including cut-away illustrations, tube layouts and dimension tables, can be obtained promptly by requesting Bulletin MH-333 from Union Iron Works, Erie, Pa.

AT TOP: 28,000 lbs. of steam per hour—that's the capacity of this Union Type MH Packaged Steam Generator which operates at 125 psig with 180 degrees feed water temperature (one of a pair serving University of Toledo).

LEFT: Steam generating plant houses two Union Packaged Steam Generators to provide space heat for 6,000 students.

RIGHT: Cut-away view of Union Packaged Boiler reveals its symmetrical, 3-drum design; divided tube banks and tangent tube wall construction.

Circle 108 on READ-N-CIRCLE card for more data

Inside—Outside Topside!

MULTI-WASH

DUST COLLECTORS need no productive floor space

Inside

How Multi-Wash collectors can be installed, up off the floor, inside the building.

Outside

Installation of collectors outside the plant, conserving floor space for productive work.

Topside

Battery of Multi-Wash units installed on the roof of a large production factory.

Schneible Multi-Wash Collectors were designed to save money in many ways. Not the least, is the variety of methods of installation. In a majority of instances Schneible installations are operating without taking away any valuable production space.

This means profit from every foot of floor space, plus cleaner, more healthful working conditions that increase productive effort.

Specify Schneible Dust Control for simplicity and efficiency.

SCHNEIBLE

CLAUDE B. SCHNEIBLE CO.
P.O. Box 81, North End Station
Detroit 2, Michigan
Circle 100 on READ-N-CIRCLE card

our readers write

. . . to industry & power

From an expert's expert

Gentlemen:

Your publication, INDUSTRY & POWER, contains much information which is very beneficial to me and the many stationary steam engineers and boiler operators whom I contact.

For more than 16 years I have been Assistant Chief of the Division of Examiners of Steam Engineers, State of Ohio, during which time it has been my duty to determine the qualifications of many persons to operate stationary steam equipment.

Your magazine has afforded me knowledge which I have been pleased to transmit to others interested in power plant operation. There are approximately 24,000 persons who are in possession of an Ohio license issued by this Division.

I am very grateful to you for the publications received in the past and shall be pleased to have you continue mailing to me INDUSTRY & POWER.

George H. Dinan
Assistant Chief of Division
Examiners of Steam Engineers
State of Ohio

● *We shall be pleased to continue sending you* INDUSTRY & POWER.

Better than we could say it

Gentlemen:

It would be impossible to edit a technical magazine in such a manner as to satisfy all fields. However, I believe that your organization is doing an excellent job. You have been able to provide a variety of substance and do so in such a style that substantial amounts of reading time are not required.

J. W. Braithwaite
Chief Engineer
Acme Engineering Materials
Toledo, Ohio

Thermo refresher and book

Gentlemen:

I am a student at California State Polytechnic College, majoring in mechanical engineering. . . . The article by Professor Lee [Thermodynamics] certainly will help me understand the subject better; it has already clarified some points.

Jorge Torrico
San Luis Obispo, California

Gentlemen:

It is refreshing to one who "took his thermo" years ago to review this fascinating subject via Professor Lee's "Thermo Refresher Course" which you are currently publishing in INDUSTRY & POWER.

F. E. Bailey
Plant Engineer
Crocker, Burbank & Company
Fitchburg, Massachusetts

Gentlemen:

Please send me reprints of each one of the chapters on the article "A Thermodynamics Refresher." I believe this started back in the May 1955 issue of INDUSTRY & POWER. . . . I also heard a rumor to the effect that this may be published in book form and would appreciate any information you may have regarding this.

Joseph W. Skehan
Vice President
Machlett Laboratories
Springdale, Connecticut

● *The individual articles comprising the Thermodynamics Refresher have been reprinted, and are available in individual packets. Single sets are free. Quantity prices are quoted on page 98. The author of the Thermodynamics Refresher, Professor John Lee, has written a book titled "Thermodynamics" which was published on June 17, 1955. Copies may be ordered at $8.50 each through* INDUSTRY & POWER *or directly from the publishers, Addison-Wesley Publishing Company.*

Glass frosting no secret

Gentlemen:

This refers to the article appearing in the September 1955 issue of INDUSTRY & POWER titled "Frost Your Windows," written by Messrs. Belknap and Gruner of the Detroit Diesel Engine Division, General Motors Corporation.

We have a similar problem of glare from clear glass windows and would appreciate being put in touch with the authors of this article for more detailed information with respect to costs and data regarding blasting pressure and type of ground stone used.

W. D. Rodrick
Plant Engineer
Raytheon Manufacturing Company
Newton, Massachusetts

Gentlemen:

On page 51 of the September 1955 issue of INDUSTRY & POWER there is an article "Frost Your Windows" by Clinton Belknap and C. T. Gruner. In this article they speak of an economical way of frosting skylight glass.

If it is possible without divulging company secrets, I would be pleased to know the method used in frosting the glass in the skylights.

H. F. Parker
Maintenance Engineer
New York & Pennsylvania Company
Castanea Mill
Lock Haven, Pennsylvania

● *Glass frosting as described in our September issue does not involve any company secrets. Full information can be obtained from Industrial Glass Company, P. O. Box 2170, Monroe Boulevard Station, Dearborn, Michigan.*

Noise bibliography

Gentlemen:

In the October issue of INDUSTRY & POWER there is a note on page 63 to the effect that an extensive bibliography on noise abatement is available upon request from you. We would appreciate receiving a copy.

Samuel Sass
Transformer Division
General Electric Company
Pittsfield, Massachusetts

Gentlemen:

We would like to obtain a reprint of the article which appears in the October 1955 issue of INDUSTRY & POWER entitled "First Step in Noise Abatement," pages 60 through 63 inclusive.

Also, we would like to have a copy of the extensive bibliography referred to in the Editor's Note.

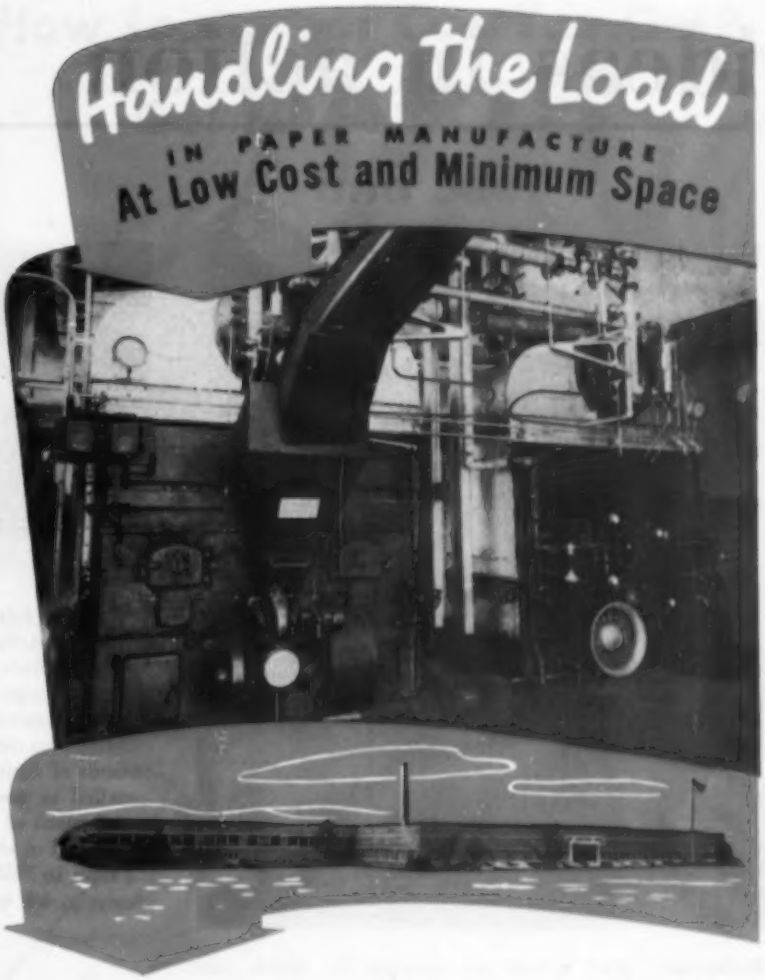
L. E. Parsons
Manager, Plant Engineering
A. P. Green Fire Brick Company
Mexico, Missouri

Gentlemen:

I would like to have a copy of the bibliography on noise which the authors, Bianchi and Goode, mention in their article "First Step in Noise Abatement" appearing in the October 1955 issue of INDUSTRY & POWER.

C. S. Murray
Engineer
Inside Plant Bureau
Consolidated Edison Company of New York
New York, New York

● *These and the many other requests for the noise bibliography are being filled by our Reader Service Department.*



TITUSVILLE TICOTHERM
STEAM GENERATORS

For Paper Manufacturers Company, at their Bustleton, Pa. plant, two main types of firing are handled efficiently by these Titusville TICOTHERM Steam Generators. No. 1 boiler has a ram-type underfeed stoker, No. 2 is equipped with oil burner for standby, providing flexibility for all processing and heating needs of the large plant pictured.

Write for your copy of informative Ticotherm Bulletin B-3250A —sent promptly on request.

A division of Struthers Wells

THE TITUSVILLE IRON WORKS COMPANY
TITUSVILLE, PA.

Manufacturers of A Complete Line of Boilers for Every Heating and Power Requirement

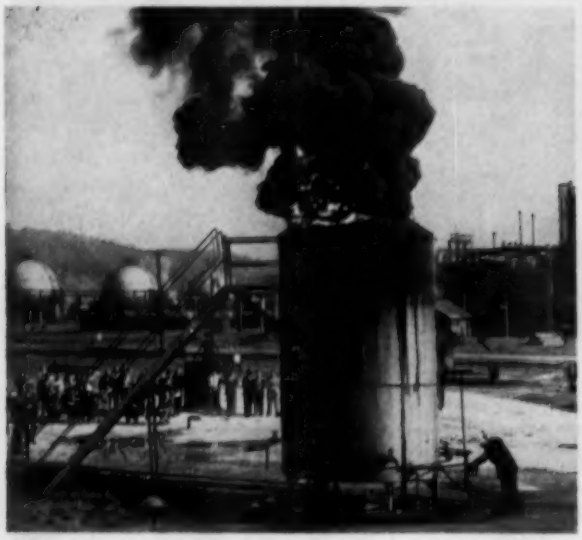
Circle 107 on READ-N-CIRCLE card for more data

ideas in action

. . . for industry & power

New tank-fire control method

Flames raging in an 8000-gallon tank of coal chemicals have been extinguished in less than 30 seconds by drowning them in cooler chemicals from the bottom of the tank. Safety engineers of Koppers Company, Inc.



deliberately fired a tank of creosote oil, which was extinguished in 22 seconds. Unignited chemicals at the bottom were circulated to the top so quickly that temperatures were reduced below the liquid's flash point. The method is equally effective with several different agitation methods. Compressed air and nitrogen have been used successfully, despite the fact that air ordinarily spreads flames. Tank fires have been extinguished using only compressed air through the normal inlets for regular mixing operations. Agitation by recirculation of liquid in the tank itself is also effective. This is done by pumping liquid from the tank, and then back again, through a jet mounted in the center bottom which is directed upwards. This stirs the tank contents. In recent demonstrations, complete extinguishment of burning creosote oil was always attained in between 22 and 46 seconds.

Gear couplings cut downtime

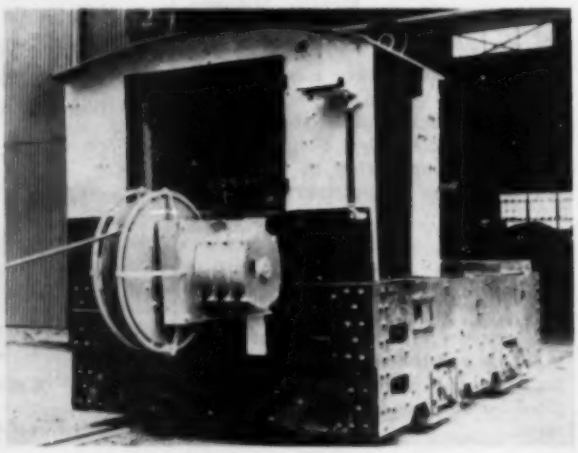
More than 10,000 hours of trouble-free performance by two gear-type spindle-roll drive couplings at the 80-inch hot strip mill of US Steel Corporation's Irvin Works are showing the way to solve a traditional mill maintenance problem. Gear-type couplings, produced by American Flexible Coupling Company, serve pinch-roll drives of the mill's coiler machinery. Using patented gear

teeth with fully crowned flanks at either end of the spindle shaft, the couplings eliminate use of brass slippers. Costly maintenance identified with universal or slipper-type couplings is also eliminated. Throughout their 18 months' service, the two couplings have required no maintenance other than periodic greasing. Weekly maintenance of each of four conventional universal couplings installed in the same coiler assembly has involved the replacement of four brass slippers. Weekly maintenance bill — cost of material plus an average 12 hours' machining time. In 1953, when universal couplings were used exclusively, 483 brass slippers were replaced.

Batteries replaced with outside power

Original storage batteries carried in a locomotive at a Detroit steel plant have been replaced by a cable reel. Locomotive conveys steel from the strip mill to the finishing building across a roadway. It travels 5 to 7 mph and operates 24 hours a day under severe conditions. Batteries functioned satisfactorily, but were unusually expensive to maintain because of severe vibration and ex-

(more ideas in action on page 66)



you can still get
I&P's special report on the

package boiler picture

The continuing trend toward package boilers demands that you keep up to date on this equipment; I & P's Special Report on the Package Boiler Picture gives a complete rundown on the principal models of this equipment.

To meet the continuing demand for this special report, reprints are made available to all readers. Single copies are free; 2 to 24 copies are 25¢ each; 25 to 49 copies are 20¢ each; 50 to 99 copies are 15¢ each; more than 99 copies are 10¢ each.

Address all orders to

Reader Service Department
INDUSTRY & POWER
Commercial Bank Building
St. Joseph, Michigan

you can still get
I&P's special report on

in-plant electric distribution

You should know about the trends that are constantly reshaping electrical practice in industrial plants. This comprehensive report offers a complete analysis of these trends in terms that apply directly to your problems.

To meet the continuing demand for this special report, reprints are made available to all readers. Single copies are free; 2 to 24 copies are 25¢ each; 25 to 49 copies are 20¢ each; 50 to 99 copies are 15¢ each; more than 99 copies are 10¢ each.

Address all orders to

Reader Service Department
INDUSTRY & POWER
Commercial Bank Building
St. Joseph, Michigan

How Leakproof Can You Get?

Get DARTS and See!

This True Ball Joint Makes the Difference

QUICK FACTS

- Leakproof because precision-machined to a true ball joint and spherically ground
- Extra wide seats of bronze alloy resist pitting and corrosion
- Heavy shoulders can take severe wrenching without damage
- Nut and body practically indestructible (of air refined, high test malleable iron)
- Individual vacuum testing of each Dart to assure absolute tightness before leaving factory

You can use Darts over and over again — they stay drop-tight and they're easy to install.

DART
UNIONS

DART UNION COMPANY • PROVIDENCE 5, RHODE ISLAND

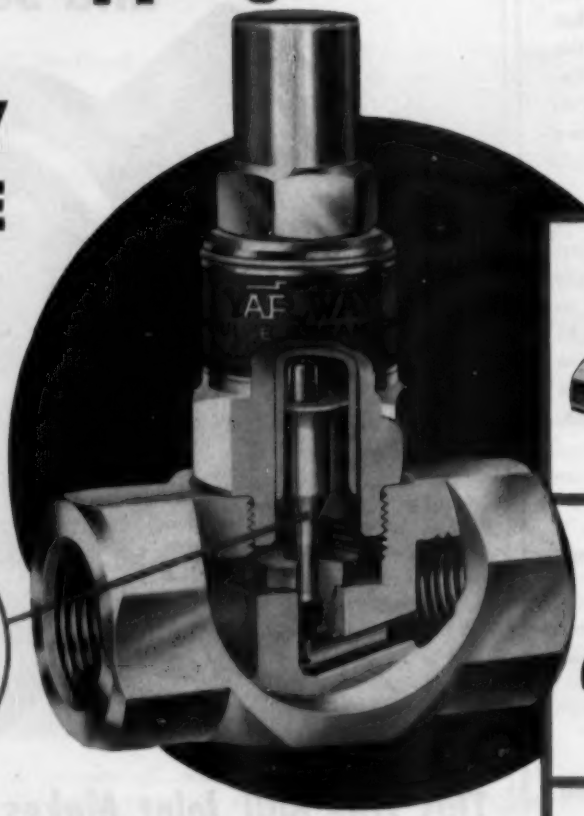
The Fairbanks Co., General Distributing Agents
Boston • New York • Pittsburgh • Rome, Ga.

CALL YOUR LOCAL DISTRIBUTOR FOR PROMPT DELIVERY OF DART UNIONS

Circle 127 on READ-N-CIRCLE card for more data

the impulse that revolutionized steam trapping

YARWAY IMPULSE STEAM TRAP



the only moving part

...a small stainless steel valve that literally floats on the condensate load. Gets equipment *hot in a hurry—and keeps it hot!*

SERIES 60 and 120

For all *normal* trap requirements, pressures to 400 and 600 psi.

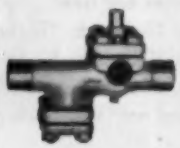
½" No. 20-A

For *light loads* on tracer lines, steam mains, small presses, etc.

SERIES 40

For *heavy loads* requiring extra high capacity steam traps.

INTEGRAL-STRAINER HIGH PRESSURE TRAP



For *high pressures, high temperatures.* (Flanged or welding connections.)

Twenty years ago YARWAY applied a unique theory of thermodynamics to steam traps—and gave industry the amazing YARWAY Impulse Steam Trap.

Today—over a million YARWAY Impulse Steam Traps later—advantages like the following continue to convert new users, and convince old users to standardize on the YARWAY Impulse:

- **QUICK HEAT-UP AND EVEN TEMPERATURES OF EQUIPMENT**
- **GOOD FOR ALL PRESSURES WITHOUT CHANGE OF VALVE OR SEAT**
- **SMALL SIZE—LIGHT WEIGHT**
- **ONLY ONE MOVING PART**
- **STAINLESS STEEL—minimum maintenance**
- **WON'T FREEZE UP**
- **A COMPLETE LINE of sizes and types for every requirement**
- **IMMEDIATELY AVAILABLE from 270 local Industrial Distributors**

For free Trap Selector, or 24 page Bulletin, write

YARNALL-WARING COMPANY
100 Mermaid Avenue, Philadelphia 18, Pa.

YARWAY IMPULSE® STEAM TRAP

OVER 1,000,000 YARWAY IMPULSE STEAM TRAPS USED

Circle 136 on READ-N-CIRCLE card for more data

Disposal plant houses all pumping and filtration equipment. Two 58,000-gallon surge tanks are at left of building and sludge pit, clarifier is in front.

S. J. PARADISO
Project Chemical Engineer
The Upjohn Company

S. J. Paradiso received his BS degree in chemical engineering from University of Illinois in 1940. He joined the Upjohn Company in 1943 as staff engineer in the Penicillin department. As project chemical engineer, he has been in charge of developing and engineering processes to produce pharmaceuticals.

I&P EXCLUSIVE

What to do with WASTES when volumes overtake CAPACITY

UNDERGROUND DISPOSAL of complex wastes from fine chemical manufacturing operations has solved a difficult waste disposal problem for The Upjohn Company in Kalamazoo, Michigan. Wastes are pretreated and pumped 1300 feet below ground into unpotable brine stratas.

All liquid wastes from the Fine Chemicals Department and the associated Research Pilot Laboratory were initially discharged to a 90-acre swamp located on company property. This was done as a matter of expedience to get manufacturing processes in operation as quickly as possible. Besides, the old trickling-filter waste treatment plant was incapable of handling any additional waste load.

Judging by appearance and odor, the swamp seemed to be capable of handling the initial waste load that was discharged from these operations. However, as additional manufacturing operations were added, waste loads kept increasing until the swamp became overloaded. It became septic. Objectionable odors were emitted and we received complaints from our neighbors. To further aggravate the problem, plans were being drawn up for additional steroid manufacturing facilities. It was obvious that something had to be done to abate this waste pollution problem, so a project was started to determine the most advisable methods.

It must be emphasized that at this stage very little data was available on strength and volume of waste from these operations. The importance of getting new processes under way as soon as possible overshadowed the importance of having a complete solution to our

waste disposal problem. Process operations were surveyed first of all to determine:

¶ Volume and characteristics of wastes;

¶ Procedures by which wastes could be reduced or eliminated at their source;

¶ Waste treatment methods that might be applicable for handling liquid wastes from fine chemicals operations.

Volume and characteristics

A preliminary survey of composite wastes from all operations included this chemical analysis

Volume	400,000-700,000 gpd
BOD	2000-10,000 ppm
BOD	6000-30,000 lbs/day
Total Solids	1000-1000 ppm
Dissolved Solids	500-7000 ppm
pH	2.0-8.0 (but usually acidic)
Color	Varied but highly colored
Odor	Organic solvents

Chief contaminants in the liquid waste stream were found to be spent mineral acids and respective salts, the lower and higher alcohols, chlorinated and unchlorinated hydrocarbons, organic acids, aldehydes, ketones, and residual fractions of steroids and their intermediates.

Obviously, all these chemicals were not present in the waste stream each day, or simultaneously, because of batchwise and multistep operations. Waste-stream composition varied considerably during each working day, with no two days quite alike.

The survey was further complicated by the highly fluid state of process operations. New steps and procedures were being added frequently, and volume and BOD of the waste increased considerably. Sometimes it seemed that none of the data we had obtained would be useful because of process changes.

These views of same section of swamp show extent of pollution and extent of improvement only one year after disposal wells were placed in operation.

Reducing and eliminating wastes

At this stage, scope of the survey was expanded to include analysis of *each* process waste stream from every one of the manufacturing and research operations that were going on. Also, a program was started to see if waste couldn't be eliminated or measurably reduced at the source by operational or equipment changes. For lack of a better title, this was called a Preventive Waste Treatment Program.

This program was most successful. It was possible to make drastic reductions in both volume and BOD of the waste. Procedures established in the Preventive Waste Treatment Program included:

¶ Separating clean waste waters from contaminated waters, and discharging all clean waters to a storm sewer system;

¶ Recovering solvents wherever practical;

¶ Collecting and hauling special high BOD wastes to waste land;

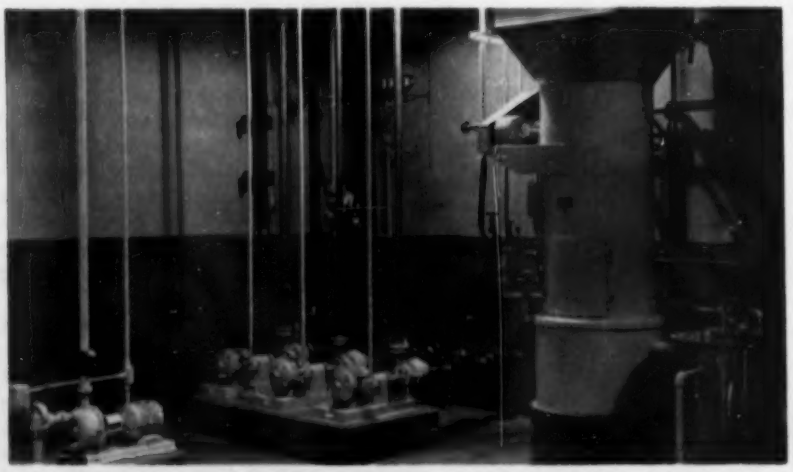
¶ Collecting and incinerating nonrecoverable combustible solvents and residues;

¶ Exhausting steam jets to atmosphere;

¶ Recycling seal water on vacuum pump systems;

¶ Providing bypass bleeder lines on drinking fountains;

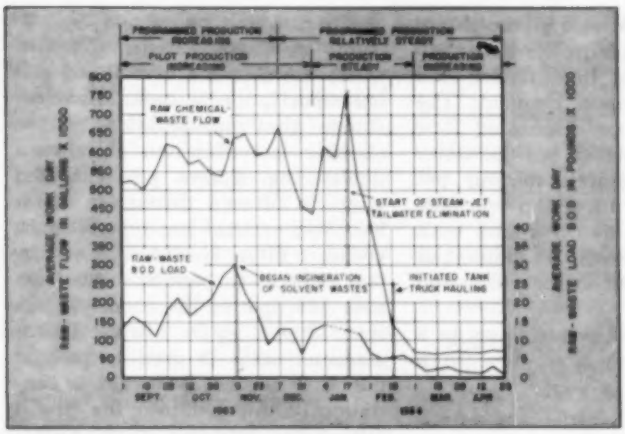
¶ Following good housekeeping practices such as turning off drinking fountains overnight and weekends, turning off hoses when not in use, and repairing leaky valves.



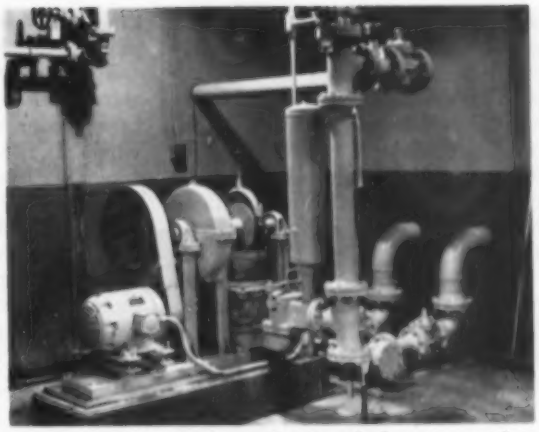
Three lift-station pumps are shown in center, lime feeder and slurry tank are at right. Sump pump is at left. pH controller automatically starts lime feed.

Better results than expected

These procedures are elementary. Obviously, they should have made a reduction in the amount of waste discharged if any violations were found. The surprising thing was that we were able to make such a



Effect of Preventive Waste Treatment Program on volume and BOD of waste was more dramatic than had been expected.



Pump moves sludge from clarifier, sludge pit, or either surge tank to 5000-gallon tank truck for dumping.

drastic reduction in the waste load. The effect of the Preventive Waste Treatment Program on volume and BOD of the raw waste is shown graphically above.

Treatment methods considered

While making the survey, we built a waste treatment pilot plant to evaluate aeration and biological processes as a means of treating the wastes. They were found to be amenable to biological oxidation. Pilot-plant data indicated that a BOD reduction of 95 percent could be obtained with either two-stage trickling filters or two-stage activated-sludge systems. A BOD reduction of 95 percent would be mandatory for our particular situation and location. However, cost for biological facilities was estimated to be more than $2 million because of the high volumes and high BOD waste observed at this time.

Other waste handling methods that we investigated were:

¶ Evaporation and concentration processes;
¶ Spray irrigation;
¶ Chemical treatment and carbon absorption;
¶ Ion exchange;
¶ Controlled use of the swamp;
¶ Hauling all wastes;
¶ Underground disposal by injection into the brine strata approximately 1300 feet below grade.

Underground disposal by injection into the brine strata appeared economically attractive and feasible. One well was drilled and tested. Injection capacity was found to be at least 100,000 gpd. When it was apparent that waste volume could be maintained below 200,000 gpd, we decided to go ahead with this type of disposal. Two wells were drilled into the Traverse and Dundee stratas, which are approximately 1300 and 1400 feet respectively below ground level in this area.

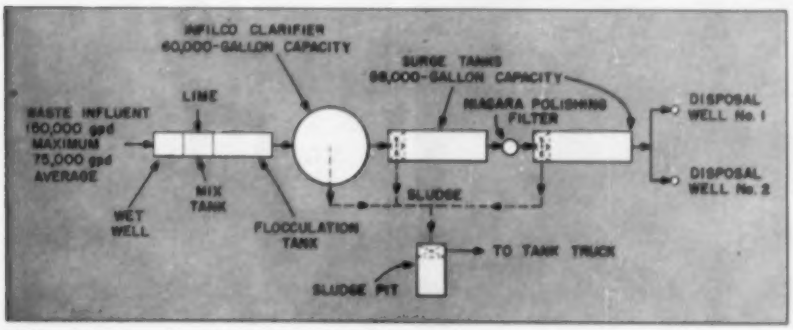
We knew from our laboratory test data that we would have to pretreat the wastes before they could be injected underground. The pretreatment process we developed consisted of adjusting pH with high-calcium lime, followed by flocculation, sedimentation, and then filtration.

A disposal plant was designed to process 150,000 gpd of composite waste from fine chemicals manufactured. In this system all contaminated liquid wastes are combined in one acid-alkali-, and solvent-resistant vitrified-tile sewer system. Wet well, mix tank, and flocculation tanks are lined with acid-, alkali-, and solvent-resistant brick, joined with Nukem mortar. Lift-station pumps are constructed of Type-20 stainless steel. Since waste pH is adjusted to 5.5 minimum, the rest of the plant was designed for neutral or nearly neutral conditions.

Disposal well details

All drilling operations were done with a cable rig. A 10-inch drive pipe was driven through the drift. Then a 7-inch OD std API oil-well casing was placed into the two formations. The casing was cemented to the surface to prevent contamination of any ground water supplies. Wastes are injected through 2½-inch dia upset steel tubing. A Neoprene "hookwall" packer is used to seal off between tubing and casing.

Raw-waste flow varies from 10 to 200 gpm during the day, because of batchwise processing operations. Three Types-20 stainless steel, open-impeller Peerless centrifugal

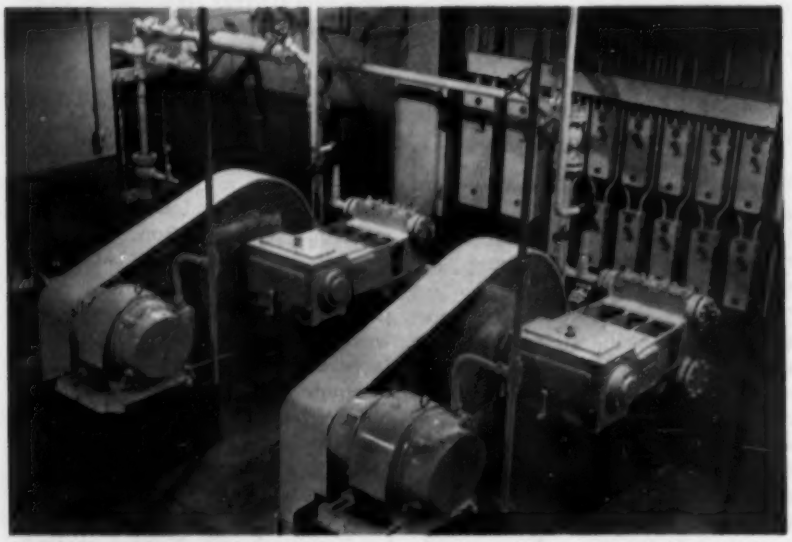


Schematic flowsheet for disposal well waste handling system that has neatly cleared up the serious septic swamp condition at the Upjohn Company.

pumps, automatically operated by an air-bubbler-type level control instrument, are used to lift raw waste approximately 20 feet into a weir box. A Bristol flow meter continuously records and integrates the volume of waste pumped from the wet well into the mix tank. Here lime is added automatically to adjust pH to 5.5.

Cell for the pH recorder-controller is located at the flocculation-tank inlet. The pH control system consists of a dry-lime feeder, a lime-slurry tank, and a lime-slurry pump. The pH controller automatically starts the lime feeder and slurry pump upon demand. The lime feeder stops dispensing lime when pH is satisfied, but the water for the lime-slurry mixing pot continues to run for a variable period of time, as controlled by a timer. This reduces the amount of lime-cake deposit in the pump and piping system.

Treated mixed waste flows to a flocculation tank and then to a clarifier, which has a nominal capacity of 60,000 gallons. Clarified waste flows to the first 58,000-gallon-capacity surge tank. Chemical sludge that accumulates in the clarifier is withdrawn daily to a dewatering sludge pit. Clarified waste is filtered through a stainless-steel vertical-leaf-type Niagara pressure filter. Its 314 sq ft of surface reduces suspended solids from over 100 ppm in the prefilt to less than 10 ppm in the filtrate. Diatomaceous earth is used to precoat the filter leaves. Body aid is continuously injected into the prefilt during the filtration cycle. Filtration is carried out at constant pressure by means of a back-pressure regulating valve located in the filtrate line. This controls feed rate to the filter. Filter cake is sluiced off manually at the end of each filtration cycle and combined with sludge from the clarifier in the dewatering sludge pit.

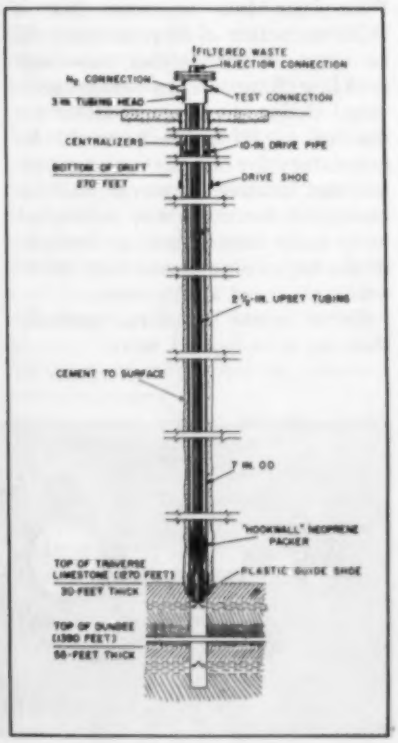


Corrosion resistant triplex plunger pumps for injecting clarified waste approximately 1300 feet below ground level are located in waste plant basement.

Filtrate pumping system

Filtered waste flows to the second 58,000-gallon-capacity surge tank—supply tank for the two National

Interior view of waste-solvent incinerator building. Three solvent atomizing nozzles may be seen in center. Charge hole is used for animal wastes disposal.



Construction details of disposal well are shown in this sectional drawing.

Supply Co. triplex plunger pumps that inject the filtered waste into the underground formations. Liquid ends of the pumps are constructed of Ni-resist with ceramic plungers. Provision has been made for installation of a third pump if this is found necessary. Present capacity of each pump is 50 gpm at 1000 lb/sq in. discharge pressure. Actual discharge pressure has been between 500 and 900 psig, depending on the number of wells and pumps that are in use simultaneously.

Sludge disposal method

Sludge can be withdrawn from the clarifier, the sludge pit, and from the two surge tanks. Sludge is pumped into a 5000-gallon-capacity tank truck and then dumped on waste land. The present volume of sludge hauled is about 40,000 gallons per month.

A concrete block building with basement houses all the pumping, lime handling, and filtration equipment. The mix tank, flocculation tank, clarifier, sludge pit, and surge tanks are outside structures made of reinforced concrete.

The disposal-well system handles all contaminated liquid wastes from our fine-chemicals operations, except for nonrecoverable solvents.

Volume treated

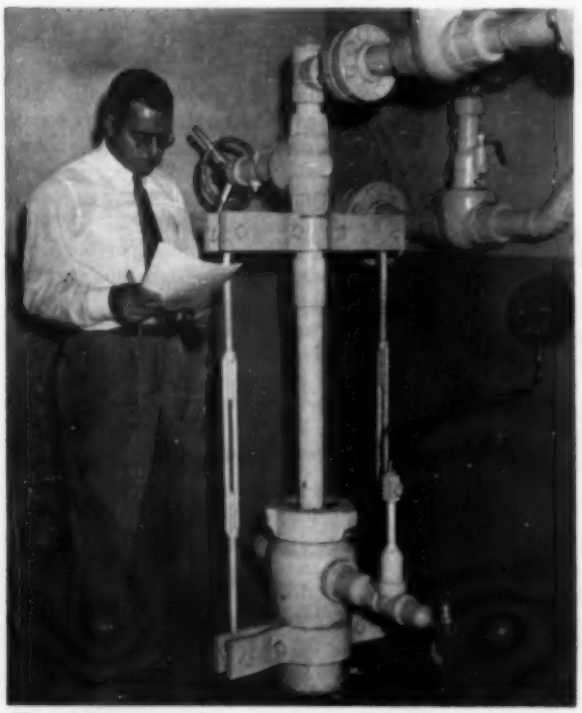
Raw waste volume discharged to the system averages about 75,000 gpd, with peaks of about 125,000 gpd. The disposal plant has been in service for one year. All equipment and operations have come up to design expectations.

Nonrecoverable solvents are incinerated in a special solvent burner system. Waste-solvent load amounts to about 3000 gallons per day. Solvent is pumped into the combustion chamber through three atomizing nozzles and directed onto a target wall. After initial ignition with bottled gas, combustion is continuous. A considerable amount of waste heat is liberated with the solvent burning operation, so all animal refuse from the research and biological laboratories is incinerated in this same incinerator. Formerly, four smaller animal refuse incinerators were used to handle this problem.

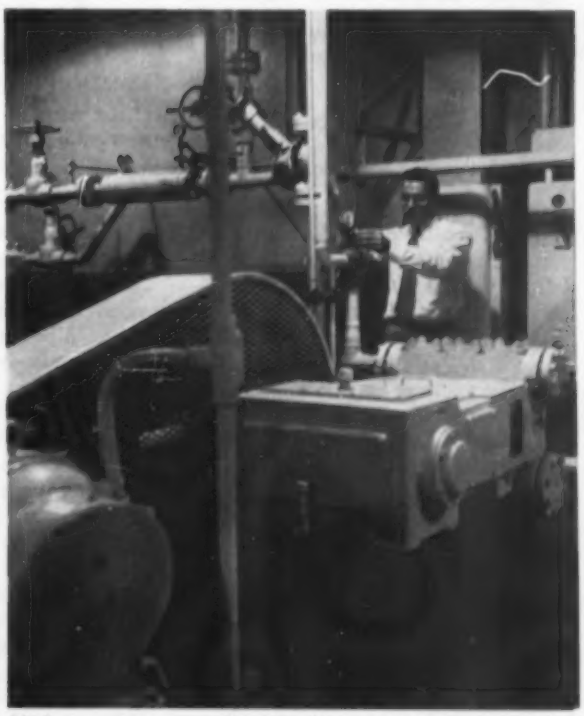
The effect of eliminating wastes from the swamp has been dramatic. During the period of heavy pollution, the swamp was characterized by thick scum blankets, dense active anaerobic sludge deposits, highly turbid water, no dissolved oxygen, and a strong odor. In less than a year after waste discharges were eliminated, the swamp has returned to its original state, or nearly so. Aquatic life of all types is found again in all parts of the swamp. Scum and sludge deposits are all gone. Now, the water is as clear as is found in good fishing lakes. Odors are no longer a problem from this area.

Water conservation

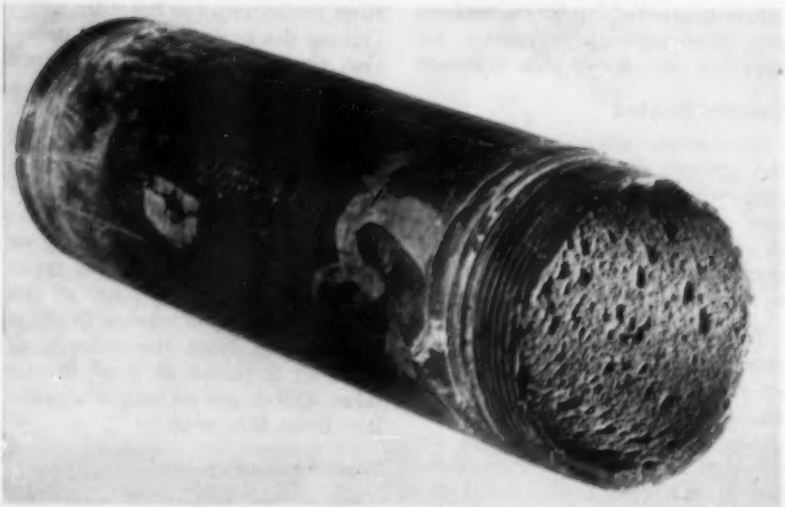
Since the swamp is near our water wells, a program has been started to develop this swamp into a recharge pond for our wells. Water level and water area are being increased by allowing more clean storm water to flow into the swamp. This will materially increase the volume of water that will recycle through the soil, and at the same time, conserve more of the natural water present in the local aquifer.



The author notes that no pressure has been recorded in the casing at the well head. Supports are for stiffening.



High-pressure pumps (made of Ni-resist) that are used to inject filtered waste into the underground formations.



Typical example of corrosion attack by oxygen present in feedwater. Note pitted metal and badly frayed edges around threads where metal is thinnest.

what YOU can do about BOILER plant CORROSION problems

ICP EXCLUSIVE

RALPH M. LEMEN
The Permutit Company

IS YOUR boiler plant absorbing its share of the several billion dollars that corrosion costs American industry each year. Causes of boiler plant corrosion can be ascribed directly to presence of dissolved oxygen or carbon dioxide in the feedwater, low pH, or a combination of all three. Each part of the boiler system must be considered separately, because each part has its own problems.

Feedwater circuits

Raw makeup water, either surface water or well water, may be saturated with dissolved oxygen. Surface waters in particular are usually saturated with oxygen because of direct contact with the atmosphere. Deep-well waters may be free from oxygen or contain only a very small amount.

Return condensate may contain oxygen as a result of air leakage through pipe fittings, pumps, and valve glands, where steam condensation forms a partial vacuum.

Corrosion of makeup piping, valves, water softeners, and so on is not too serious, because raw makeup temperatures are generally low. However, as water temperature increases in passing through heat exchangers, pumps, or in mixing with hot condensate returns, the oxygen's corrosive action is greatly accelerated. Oxygen corrosion is characterized by pitting of the metal surfaces. There is a well-known rule in chemistry that speed of reaction is approximately doubled for each 18 F increase in temperature. Therefore, water at 88 F is almost twice as corrosive as water at 70 F. This is partly compensated for however, by the decrease in solubility of oxygen with increase in temperature.

CO_2 also present

Surface waters and well waters may also contain free carbon dioxide. This is corrosive by itself. But if oxygen is also present, the two gases acting together are more corrosive than the same quantities acting independently. Carbon dioxide corrosion can be recognized by general thinning and grooving of the pipe walls or metal surfaces.

In a surface condensing plant where feedwater is relatively pure, water pH may be lower. Iron or steel piping will be attacked (even at low temperatures) to form ferrous hydroxide. This attack will continue throughout the system until the ferrous hydroxide, being alkaline, raises the pH to approximately 8.3. At this point no more iron will go into solution. Any oxygen present will oxidize the ferrous ion to ferric ion, precipitating insoluble ferric hydroxide and allowing more ferrous hydroxide to be formed. Carbon dioxide in the water will lower the pH further and dissolve more iron. Precipitated ferric hydroxide will adhere to piping and be carried into the boiler to coat boiler tubes, start localized attack, and cause tube burnout.

A combination of corrosion and erosion presents a further problem in the case of pumps, valves, and pipe fittings. Sudden changes in direction of the water stream sweep clean any iron deposits that might have formed on the surfaces. Bare metal is then exposed to further attack.

Deaerate feedwater

Corrosive influence of dissolved oxygen and carbon dioxide in boiler feedwater may be eliminated through efficient mechanical feedwater deaeration. This process will reduce oxygen content to less than 0.005 ml per liter and free carbon dioxide to zero. Mechanical deaeration is often followed with a chemical oxygen scavenger for removing the last traces of oxygen

from the feedwater.

Any corrosion that occurs within a boiler can usually be traced to presence of dissolved oxygen in the feedwater, although there are other factors that cause corrosion and pitting of internal surfaces. In general, carbon dioxide is not a contributing factor as long as the desired boiler-water alkalinity and pH are maintained.

Only dissolved oxygen corrodes

Oxygen must be dissolved before it can attack ferrous metal surfaces. Normally, gases dissolved in the feedwater entering a boiler drum are released immediately to the steam, because of the substantial temperature increase. Sometimes, however, a sudden increase in feedwater demand and high boiler circulation carries cooler entering water into the downcomer boiler tubes before the oxygen has had a chance to be released. This causes corrosion below the water line and at the tube inlets.

Sometimes corrosion products within a boiler can be attributed to iron oxides contained in the entering feedwater. These oxides are usually either red oxide (which is stable) or black oxide (formed when oxidation cannot go to completion). If they are not removed by blow-down and are allowed to form deposits in the areas of less rapid circulation, a hard, dense adherent scale can form. This scale causes overheating of the metal and further production of iron oxide.

Intercrystalline cracking or caustic embrittlement may accompany overheating of tube metal. High concentrations of caustic soda may form at overheated spots and start attack along the grain boundaries of the metal. Caustic soda may also concentrate in other hide-out spots in the boiler (such as ends of boiler tubes where they are rolled into the drum). It can also precipitate out of solution where steam formation is too rapid for replacement by water circulation, which allows the tubes to become dry.

Intercrystalline cracking may occur at these points of high caustic concentrations if boiler metal is stressed and if water has embrittlement characteristics. This type of attack was more pronounced when boilers had riveted seams.

Earlier investigations of caustic embrittlement favored maintaining certain sulfate-carbonate ratios, as suggested by the ASME. However, relatively recent work indicates that these ratios do not necessarily prevent attack. Another method is to maintain certain ratios of sodium nitrate to sodium hydroxide. Some plants use a coordinated pH-phosphate method whereby pH is kept equal to that of trisodium phosphate in distilled water. This method can be used only where feedwater is all condensate, or where it contains no carbonates that could break down in the boiler to form hydroxides. Embrittlement characteristics in water can be determined by an embrittlement detector developed by the Bureau of Mines.

Economizers must have steel tubes because of high boiler pressures. If feedwater contains oxygen or carbon dioxide, corrosion of the steel tubes will occur as feedwater temperature is elevated in passing through the economizer.

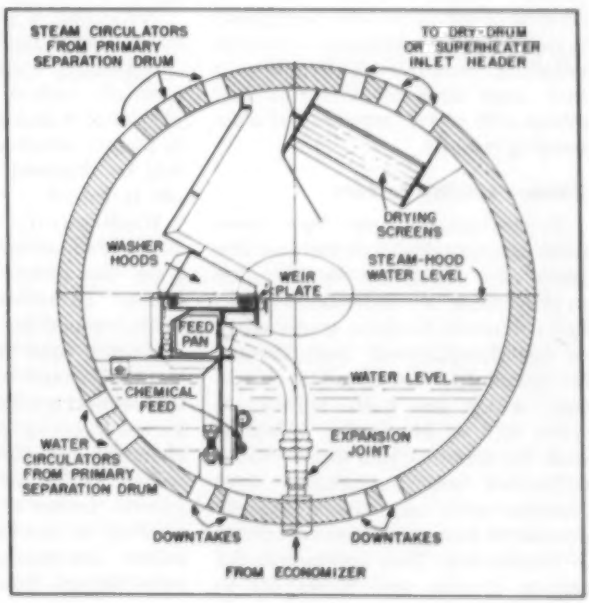
Corrosion within a boiler can be prevented by employing an efficient deaerating heater for removing on non-condensable gases from feedwater, by maintaining proper pH, and by providing good operating conditions within the boiler.

Condensate return circuits

Condensate return-line corrosion may be caused by presence of either dissolved oxygen or carbon dioxide (or both) in the condensate. An efficient mechanical deaerating heater in the feedwater circuit will remove all oxygen and free carbon dioxide before it enters the boiler. In the boiler itself, however, bicarbonate or carbonate alkalinity will decompose, introducing carbon dioxide to the steam.

It has been demonstrated that high temperature conditions within

Boiler-drum internals below water level are liable to corrosive attack by oxygen because of sudden feedwater demand. High circulation carries cooler feedwater into downcomer tubes before oxygen is released to steam.



Combustion Engineering

Typical example of corrosion attack by carbon dioxide. Here, the pipe is completely eaten away in spots and is paper-thin in surrounding areas. High temperatures and presence of oxygen greatly accelerate rate of corrosion

W. H. & D. L. Belt Company

a boiler causes complete decomposition of bicarbonate alkalinity and approximately 80-percent breakdown of carbonate alkalinity in accordance with these equations:

$$\frac{2\ NaHCO_3}{100\ as\ CaCO_3} = \frac{Na_2CO_3}{100\ as\ SaCO_3} + H_2O + \frac{CO_2}{44}$$

$$\frac{Na_2CO_3}{100\ as\ CaCO_3} + H_2O = 2\ NaOH + \frac{CO_2}{44}$$

CO_2 from bicarbonates $= 44 + (.80 \times 44) = 79$

CO_2 from carbonates $= 44 \times .80 = 35$

For each 100 ppm of bicarbonates in the feedwater, 79 ppm of carbon dioxide will be given off with the steam. For each 100 ppm of normal carbonates, approximately 35 ppm carbon dioxide will be evolved. At points where steam is condensed in the return system, carbon dioxide will be redissolved to form carbonic acid, and corrosion of return lines will occur.

Feeding of ammonia or ammonia compounds to the system for neutralizing carbon dioxide and raising condensate pH is practiced in many plants. High boiler temperatures decompose these compounds and ammonia gas is released to the steam. As the steam condenses, ammonia is redissolved in the condensate and reacts with CO_2 to form highly soluble carbonate compounds. This raises pH. Controlled feeding of ammonia into the system is rather difficult because of its high volatility. Another disadvantage is that high concentrations of ammonia will attack copper- and zinc-bearing metals.

Amines coming to fore

Neutralizing amines have been used in many plants in the past few years as a substitute for ammonia in prevention of condensate return-line corrosion. Organic amines such as cyclohexylamine, benzylamine, or morpholine are alkaline chemicals, which are quite soluble in water and which readily volatilize with the steam. When these amines redissolve with condensate, they combine with any carbon dioxide present to form an amine carbonate or bicarbonate. This neutralizes the carbon dioxide and raises pH to prevent corrosion in the return system. Although amine treatment is more expensive than ammonia, it provides easier control of condensate pH. Danger of attack on copper or zinc alloys is eliminated.

More recently, filming amines have been developed to protect return lines against corrosion. Instead of reacting with carbon dioxide in the steam, filming-type amines form a nonwettable film on metal surfaces. The film acts as a protective area between metal and condensate. Uusally this type of amine is fed into the main steam line, where it is diffused and carried along to form a film on all contacted surfaces. Quantity of amine to be fed to the system is independent of amount of carbon dioxide present in the condensate. Usually only 15 to 30 ppm of dispersed-type filming amine is necessary to properly cover all metal surfaces. In most cases, therefore, this treatment is cheaper than a neutralizing amine treatment.

Wet stages of turbines

In plants where steam is used to produce power, bled steam is taken off at various turbine stages to heat water as it passes through the stage heaters. Boiler feedwater consists almost entirely of condensate, with only one-or two-percent makeup being added to take care of losses from leakage. Makeup water is either demineralized or distilled from evaporators.

Alkalinity is essentially zero because of high purity. No breakdown of alkalinity occurs in the boiler to give off carbon dioxide. In faet, pH value is so low as to cause iron to go into solution. Feedwater lines will be attacked unless condensate pH is raised.

High-purity water demands complete removal of oxygen from the system to prevent corrosion. Therefore, the deaeration heater must be a good, efficient operating unit that will give substantially zero oxygen content in the deaerator effluent. As added insurance, many plants also use a chemical reducing agent (such as sodium sulphite) to remove any minute traces of oxygen still remaining in the feedwater. Sodium sulfite decomposes in high-pressure boilers, however, to give off sulfur dioxide, which redissolves to form sulfurous acid as the steam condenses. Condensate pH is then reduced, causing corrosion of the turbine wet stages and condensate lines. Extensive investigations by Alexander and Rummel have shown that for boiler pressures in the range of 1200 to 2000 psi, sulfite breakdown is very rapid.

Sulfur dioxide neutralized

Ammonia and its compounds are also used to neutralize the effect of sulfur dioxide in condensate. Although ammonia passes off with the steam (raising pH), it will not redissolve in the condensate as rapidly as sulfur dioxide. This results in serious corrosion in turbine stages immediately following the first steam condensation, even though sufficient ammonia is present to maintain desired pH at the condensate pump discharge. A survey at the Mystic Station of Boston Edison Company substantiated this fact. Considerable corrosion in the wet stage areas of one of their turbines was found in spite of proper pH being maintained at the boiler feed pump suction by ammonia feeding.

Some plants have switched over to the use of amine-type chemicals as a substitute for ammonia because of its inability to give full protection against corrosion throughout a turbine and condensate return system. Only a few amines possess the required properties for high pressure systems, morpholine being the most outstanding because of its stability at high temperatures. Also, morpholine has a vapor pressure which permits it to volatilize at very low concentrations. Morpholine vapor condenses in the proper proportions with the very first formation of condensate, protecting against corrosion throughout the system as well as at those initial points which ammonia will not protect.

Corrosion diffculties encountered in the initial wet stages of turbines at Mystic Station were corrected by feeding morpholine with sulfite. Morpholine has also been successfully used at the Coughlin Steam Electric Station of the Central Louisiana Electric Company, where a small residual of carbon dioxide in the system was causing some

iron pickup. After morpholine treatment, the carbon dioxide was reduced to zero throughout the system. Iron content of the feedwater was reduced to a consistent 0.1 ppm or less.

In view of the difficulties encountered with sodium sulfite as an oxygen scavenger, and the fact that sulfite breakdown is very rapid at boiler pressures above 1200 psi, considerable interest is being shown in hydrazine as an oxygen scavenger. Hydrazine has been used in Europe for several years, but it has been used only recently in this country. It holds particular promise as a reducing agent in feedwater conditioning because its reaction products do not increase total solids content or give acidic reactions. If hydrazine concentration is carefully controlled, reaction of hydrazine in boiler use is $N_2H_4 + O_2 = N_2 + 2H_2O$

If excess hydrazine is used, enough decomposition to ammonia may occur to attack copper-and zinc-bearing metals. Hydrazine is usually used in hydrate form.

Hydrazine does not always react with oxygen, so satisfactory results cannot be predicted in all boiler plants. This reaction mechanism is not yet fully established, but experimental work indicates that some form of catalyst in the feedwater supply may be necessary to insure complete reaction. Considerable experimental work with hydrazine is now being conducted. Undoubtedly its use will gain importance as its properties become better known.

Water-supply shortages have greatly increased the applications of circulating cooling-water systems in preference to the once-through system. Once-through systems are widely used, of course, where rivers, lakes, or oceans afford an unlimited supply.

In any cooling-water system, corrosion or erosion of metal parts and excessive scale deposits (which might substantially decrease heat transfer rates) must be prevented. In most cases, scaling of heat-transfer surfaces is caused by precipitation of calcium carbonate. This results from calcium bicarbonate naturally present in the cooling water breaking down under rising temperatures. For this reason, scale formation is most prominent in the hotter sections of heat-transfer equipment. Sometimes, when scale formation is heavy in these hot sections, there is no scaling at the cooling-water inlet. Then, clean, bare metal is exposed to corrosion. Tendency of cooling water to form calcium carbonate scale in any particular part of the system can be predicted by using the Langelier Index. This takes into account calcium hardness, total alkalinity, pH, total dissolved solids, and temperature.

The Langelier Index is a numerical figure derived from equations. A positive index value indicates a tendency to deposit calcium carbonate scale, a negative index indicates corrosion tendencies.

Cooling-water systems are usually limited to certain predetermined and fixed temperature conditions. Selection of proper water treatment for adjusting the calculated index figure has to take into consideration calcium hardness, total alkalinity, and pH. An increase in any of these factors (including temperature) will increase scale-forming tendencies of the water. Total dissolved solids content has only a minor effect on the index figure, and is seldom considered.

In selecting equipment to prevent excessive scaling in one section of heat exchange equipment, it is necessary to consider what will happen at other points where corrosive tendencies are indicated. Often enough, a treatment may be selected that will give a slightly negative index figure at those points where corrosion-resistant alloys are used, and a slightly positive index figure at locations where ferrous surfaces are used.

In order to prevent excessive scale in a system and at the same time to avoid corrosion, "controlled scale" treatment is sometimes used if control conditions are suitable and temperature differentials are small. Cooling water is treated (using the Langelier Index) to give a slightly positive index so as to deposit a thin uniform film of calcium carbonate scale throughout the system. This thin film does not reduce the heat-transfer rate of exchange surfaces by any appreciable amount. Surfaces are protected against corrosion, however. This type of treatment prevents scale formation and is a fairly inexpensive method of corrosion control.

Bibliography
"Corrosion Problems in Steam Power and Industrial Boiler Plants", presented at University of Tennessee Corrosion Conference, March 2nd, 1955.

Water for steelmaking

SLAKING THE STEEL industry's thirst requires nearly six million gallons of water every minute, American Iron and Steel Institute reports, on the basis of a Bureau of the Census survey.

In 1953, blast furnaces, steelworks and rolling mills used a total of 3,108-billion gallons. About 55 percent of that water, however, was recirculated back into surface water sources, often in a purer condition than when received.

Blast furnaces accounted for about one-third of the water used by the steel industry, excluding coke plants. More than 57 tons of water (13,757 gallons) was used per ton of pig iron produced in 1953. By comparison, less than 3.2 tons of solid raw materials was charged into blast furnaces per ton of iron output during the same period. However, the water used in blast furnace operations is mostly for cooling purposes, and about 80 percent of it is returned to its source in a continuous recirculating system. Steelworks and rolling mills recirculated 42 percent of the water they used in 1953.

More than 90 percent of blast furnace and 80 percent of steelworks and rolling mill water requirements were taken from streams, rivers, lakes, and other surface water sources. Less than five percent of total water usage came from ground sources such as wells and springs. The small remainder was obtained from public water systems.

Designer takes a close-up look at one of the light-weight luminaires that give high light level without direct glare.

New era on the way . . .

High-Frequency Fluorescents

I&P EXCLUSIVE

J. H. CAMPBELL and J. L. TUGMAN
Lamp Division
General Electric Company

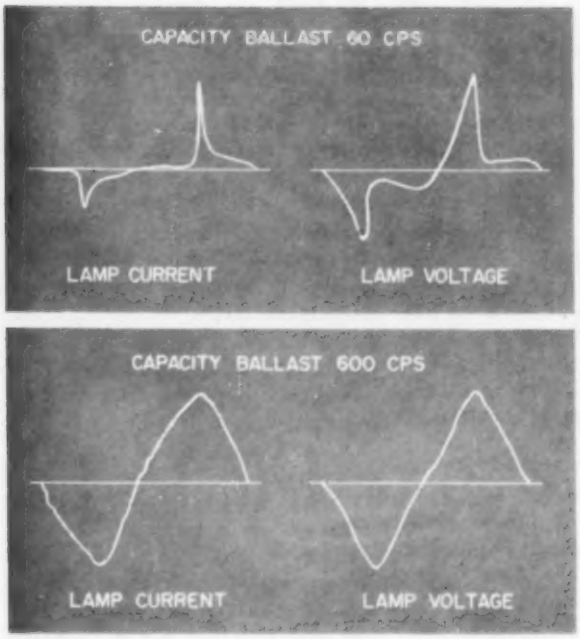
MORE LIGHT for less cost is one promise the future holds for industrial plants. Fabulous as its performance demonstrates, U. S. industry neverthless is poorly, even badly, lighted. Today, perhaps no more than 15 percent of industrial plant space may claim to be lighted satisfactorily. Some experts would place the figure at five percent. In any event, it would seem that the future can be literally much brighter, with improved comfort and more profit for all parties concerned.

Fluorescent lighting came to industry's rescue as World War II posed unprecedented production problems. Rundown industrial plants needed a big lift for their seeing tasks. Fluorescent lamps provided the lift without adding burdens to underpar wiring. They also introduced a quality factor that has made fluorescent lighting sought for almost every type of industrial space. High-frequency operation puts the quality features of fluorescent lighting into a new phase of usefulness.

It is no surprise, therefore, that high-frequency lighting has become a topic of keen interest to industry. In recent months this subject has emerged from experimental installation into commercial accessibility as a practical resource. This follows from studies made of the new high-frequency lighting at Union College Field House in Schenectady.

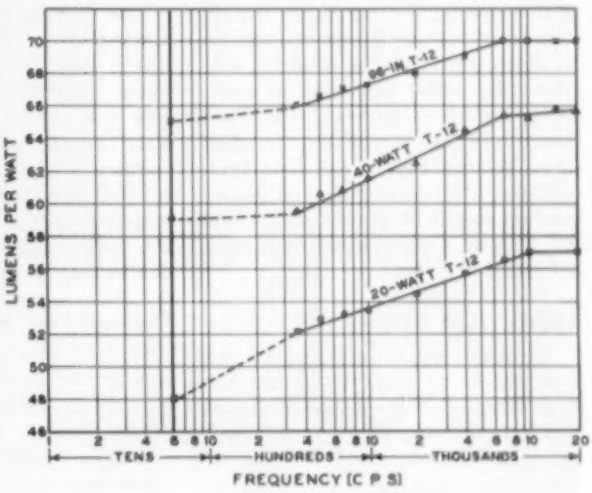
Many experienced engineers regard this installation as the take-off point for a new period of design and installation practice. Careful comparison of the revolutionary high-frequency system with older, conventional lighting showed many quality features that clinched the choice for Union College. Here are some reasons why:

¶ A generally higher level of lighting (46 fc maintained) suitable for all activities is obtained. Superior economy of the system makes



Wave-shape differences (left) show why performance improves from very poor at 60 cps to very good at 600 cps.

Reduction of end losses at higher frequencies accounts for improved efficiencies (below). This gives more watts.



better use of the character of the illuminant. It makes possible a luminaire design, which provides the desired level without imposing over-bright fixtures in the field of view. Remarkable lightweight, thin cross-section luminaires (designed by Carl Allen, GE School Lighting Specialist) shield the lamps so skillfully that direct glare is eliminated.

¶ Color quality of the lighting offers no problems of adaptation for athletes' or spectators' eyes. This could not have been so successfully provided by a 60-cps fluorescent or by a combination mercury-filament system.

¶ No hint of stroboscopic effects hamper the play of athletes or the view of spectators. The installed system can claim a high degree of refinement.

Where does industry come in?

What does industry see in this experience to raise its expectations? What does a college fieldhouse have in its lighting problems that make their solutions helpful to industry?

Answering the last question first, we concede that the fieldhouse space has very special dimensions. In this respect, however, it corresponds to the variety of service required in large plant areas. Industry has often compromised on lighting and seeing conditions by choosing equipment that is suitable to rough work for areas where skilled work is also required. Industry has excused its neglect by relegating lighting to a minor role in production, widely regarding it as an overhead expense. High-frequency lighting, however, may help industry assess this facility as its top production tool.

The flexibility it confers on lighting, in relating its contribution to production efficiency, commends it for attention. Scrutinized closely, its major advantages over conventional lighting become clear and convincing. Even canniest managements are likely to agree that here is a resource that matches the trends in present-day industrial practice.

Let us consider a few facts about industrial trends. Plant investment per worker is going up rapidly. More skills are in urgent demand to keep pace with technological advance. All the implications in that catchword "automation" impress us with the need for a new respect for lighting. When the labor content per unit of product was higher, it was common practice to put the burden of adaptation to poor lighting on the eyes of employees. This was wasteful, but it was an extension of industry's old custom, without the benefit of recommended lighting practice. Tomorrow's production quotas must avoid obvious waste and risks. Even customary, underpar electric lighting may be recognized by management as a serious handicap in a few years. In the face of the advantages of high frequency fluorescent lighting, this conclusion would seem inescapable. Let's take a look at these advantages.

Lightweight (low-loss) ballasts

On 60-cps systems, a choke coil ballast, designed to operate one 96-inch T-12 slimline lamp at 600 milliamperes, weighs about 8 pounds. By contrast, a ballast to operate the same lamp at 400 cps weighs about 2 pounds. This comparison bears out the well-known fact that as frequency increases, components such as reactors and capacitors become smaller, lighter, and, usually, lower in cost for equal production quantities. Capacitor ballasts are not practical at 60 cps because of the peaked form of current delivered to the lamp. Above 300 cps, a capacitor will deliver proper wave form to the lamp, making practical a ballast weighing only three ounces and having a loss of only two watts or less. The capacitor ballast operates one lamp,

and a choke coil operates the other in a 400-cps two-lamp unit.

Weight reductions of this order make weight and material savings possible elsewhere in the system. For instance, the aggregate weight of a conventional 60-cps installation of fluorescent lighting requires substantially larger provision in structural members carrying the load. Less lighting might be installed than desired because of load limitations. Or, conversely, a better system might be chosen if it could be had at a substantial reduction in weight.

Lightweight fixtures

By reducing ballast weight and locating it in the power supply, high-frequency operation liberates the fixture designer. Released from concern for heavy ballasts and related heat loss, he can eliminate the ballast compartment and work out his design with lighter-gauge metal. Very different fixtures are possible with these limitations removed. Capacitor ballasts, even choke ballasts, can be made small enough for socket mounting. This simplifies wiring within the fixture. It permits installation of ballasts to deliver any lamp current (within the lamp ratings) for a wide choice of brightnesses. Custom application requirements can now be satisfied on a broad range.

Higher circuit efficiency

Lower losses of high-frequency ballast result in high load-circuit efficiency. With many combinations of lamps and ballasts, increased efficiency suffices to balance the losses of frequency conversion.

More lumen output per lamp

In many installations, best overall lighting economy lies in the possibility that the lamp can be made to deliver more lumens per foot of length. At high frequency, some presently listed lamps may be operated at higher wattage than their 60-cps ratings for this purpose. Early tests indicate this option can be had without sacrifice of lamp life. This feature deserves attention. We are always underestimating tomorrow's needs. Lighting system flexibility helps provide a reserve for more illumination when needed without interrupting plant operations, and at no additional expense.

Lower overall cost of light

The possibility of exceptions always exists. However, it seems likely that the economy of high-cycle operation should be attractive for many production areas. Each prospective installation will require a separate analysis to determine comparative costs. Ultimately, savings will be increased as the cost of system components is decreased by larger production.

Reduced load on air conditioning

In controlled-condition plants—which tend to grow in numbers and importance—the 10-to 30-percent lower wattage at the fixture for equivalent light output is a very significant factor. Actual percentage gain, of course, depends upon lamp size and type of frequency converter. (Most system losses are in the converter, which can be located, usually, where air conditioning is not required.)

Lower distribution cost

Converters have been designed to increase voltage as well as frequency. At 600 volts (300 to ground) there are fewer branch circuits and consequently lower costs.

Lighting loads, especially in larger plants, are becoming high enough to make a separate power system a good economy. In even a medium-size plant, the lighting load may be 350 kw, while larger operations may require 1000 kw for this service.

For loads of such size and even as low as 50 kw, savings from high-frequency operation of fluorescent lamps present an opportunity with very far-reaching possibilities. It is quite as natural to convert power frequency to gain advantages in lighting as it is to change primary voltage with centrally located transformers for filament lighting.

Today, there are two types of converters available. One is the magnetic frequency multiplier at 360 cps. The other is the rotary converter, the type used in the Union College Field House installation. This converts 60-cps power to 400 cps.

Conversion at a much higher frequency has been considered. At ratings for available converters, however, most of the advantage of higher cps is achieved. At a frequency as low as 360 cps, with a square wave form, efficiency is equivalent to 7000-cps sine wave.

Magnetic frequency multipliers offer several advantages. These are:

¶ Low maintenance (there are no moving parts);

¶ Production of the desired square current wave;

¶ Location in transformer vault is possible;

¶ Output regulation to increase or decrease current to the lamp load.

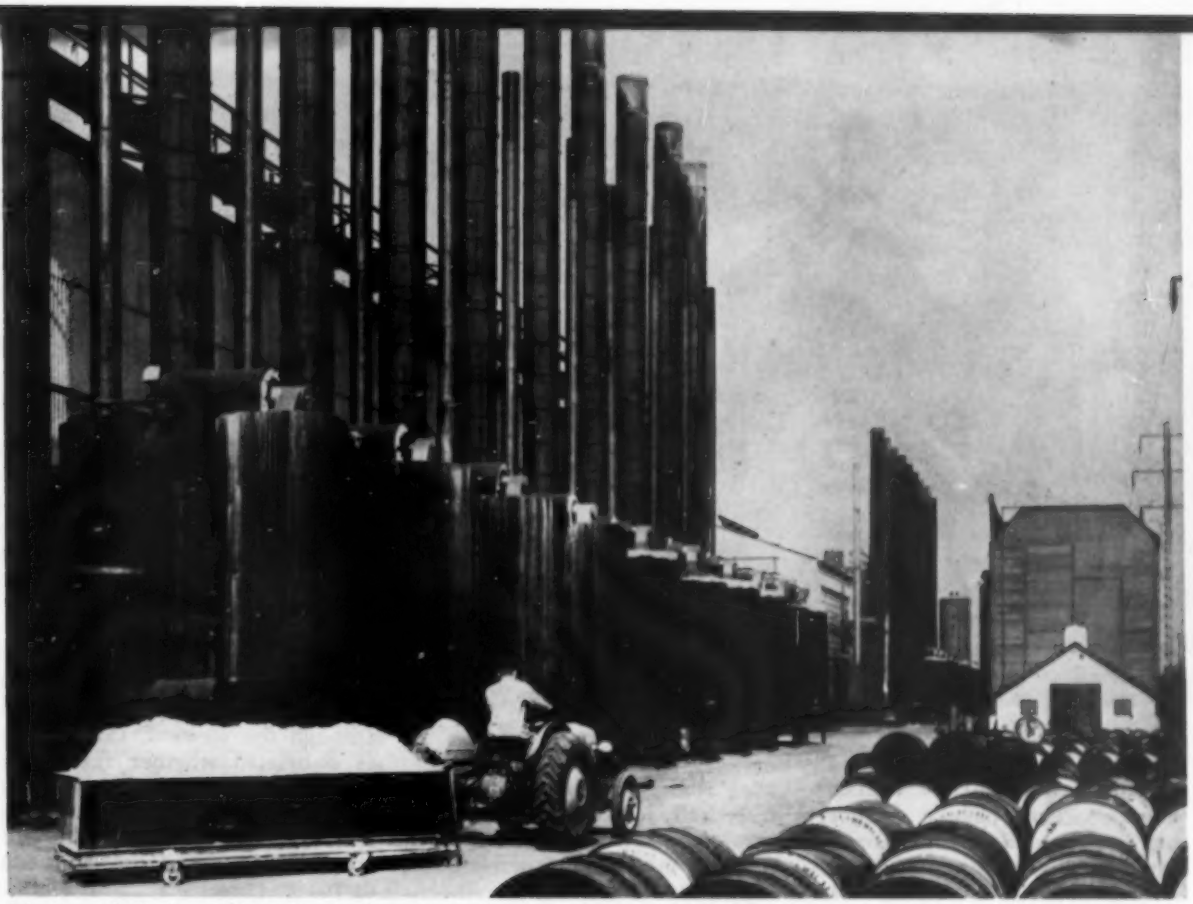
¶ High efficiency, about 75 percent.

There are limitations too, including necessity of three-phase power input (which might exclude smaller plants); and higher initial cost, although this may be expected to change as usage grows.

The rotary converter is relatively low in cost and is reliable in service. It is well known, having been in use over 50 years. It is the basis for the successful high-frequency system at Union College Field House.

In the constant search for better production tools, lighting is a relatively untapped resource. High frequency makes the quality features of fluorescent lighting a vital new production essential.

Interior of Field House has five rows of seven high-frequency luminaires.



These catalytic fume disposal units burn natural gas at a rate of 5 Btu/cu ft of air, to maintain inlet temperatures.

I&P EXCLUSIVE

FUME ELIMINATION may be only half the story

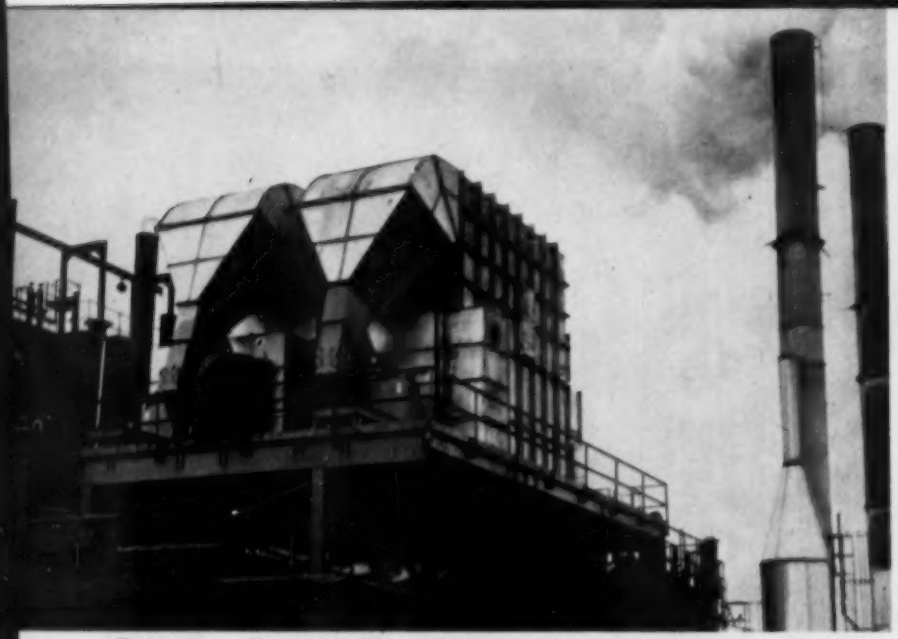
H. MEIGEL, Plant Engineer, Reichhold Chemicals, Inc., Detroit

WE KNEW WE had a tough air pollution problem on our hands right from the start of operations. Our plant is situated in the center of a residential district, and complaints from residents were fast and furious. Exhaust gases from our phthalic anhydride manufacturing plant contain 1:4 naphthaquinone, oleic anhydride, and a mixture of various organic acids —a highly irritant mixture.

In 1948, we tried knockout boxes and water sprays, but although they were about 90-percent effective, they did not remove the lachrymatory from the fumes. Activated carbon proved to be quite ineffective, and regeneration was a big job. Next, we tried ozone. We did not have much success, however, and in any case costs would have been prohibitive. Selective solvents with very low vapor pressures were moderately effective, but solvent losses were high, and this method presented a severe fire hazard. The possibility of using an extra-high stack was eliminated because we knew that the fumes were objectionable as much as seven miles downwind from the plant. By this time we were getting desperate, and so were our neighbors.

As a last resort we decided to try catalysis. A pilot unit of 5 to 10 cfm was set up for laboratory test in 1949. This proved to be 100-percent effective, so one production unit was installed. Its success was obvious. More were added until now we have 28 of these units on our production line. Our community relations have improved 99 percent, and fire hazards have been greatly reduced.

Catalytic combustion is not a new invention. It has been in use for a long time as a means of energy reclamation. Originally, the catalyst—usually a platinum alloy —was coated on a ceramic support such as balls or Raschig rings. Ceramics are cheap, satisfactory at high temperature, and chemically inert. When coated with a catalyst,



Twin units will accommodate pollution surges—most common cause of nuisance complaints, since neighbors never become conditioned to a constant odor level.

they do have several disadvantages, however. They have a relatively high weight, and flaking occurs because of expansion-coefficient difference between the ceramic base and its metallic coating with continual heating and cooling.

Use metallic elements

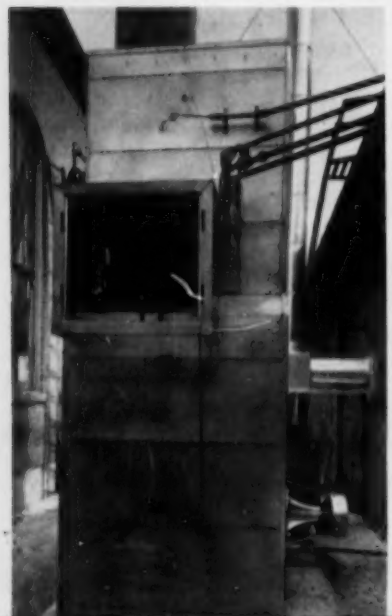
We use catalyst supplied by Catalytic Combustion Corporation. It consists of crimped high-nickel-alloy ribbons that have been electrolytically coated with the catalyst (a platinum alloy with precious metals) and activated at high temperatures. These ribbons are laid random fashion in a standard-size channel frame. Frames lie on an asbestos gasket supported by angle irons and are easily removed for maintenance. A frame for 350 cfm of 70 degree equivalent gases weighs about seven pounds and causes a pressure drop of about ¼ inch wg.

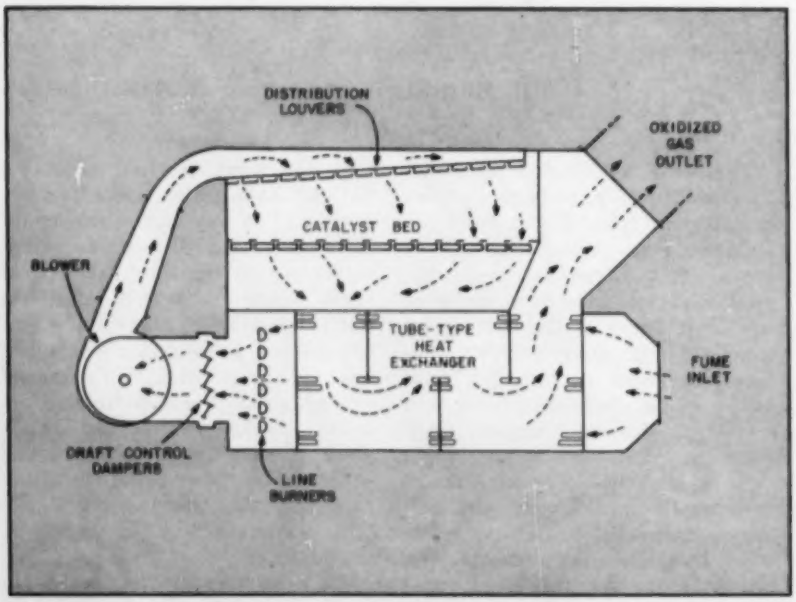
Oxidation of hydrocarbon or organic vapor results in heat liberation, as well as in conversion of noxious fumes to carbon dioxide and water vapor. A typical industrial paint-baking oven may liberate vapors from 10 gallons of solvent per hour to atmosphere. If the solvent's heat of combustion value is 120,000 Btu per gallon, this release of latent energy in the exhaust stream represents a heat recovery potential of 1,200,000 Btu per hour. This wasted energy may be in the order of magnitude of heating requirements for the oven itself.

Combustion always complete

Catalytic combustion occurs when combustible fumes are passed through the element. Combustion is completed whether the fumes are present in mere traces or in concentrations approaching the flammable range. Reaction will start at temperatures of about 500 to 700 F. Direct combustion without catalysis would require temperatures up to 1400 F. The catalyst merely accelerates the oxidation reaction without taking any chemical part. Catalytic reaction results in a temperature rise in effluent gas that is proportional to

Gas- or oil-fired units can be custom built to fit any particular space, because of versatility of package elements around which units are built. Often, best location is on roof, which shortens length of duct required.





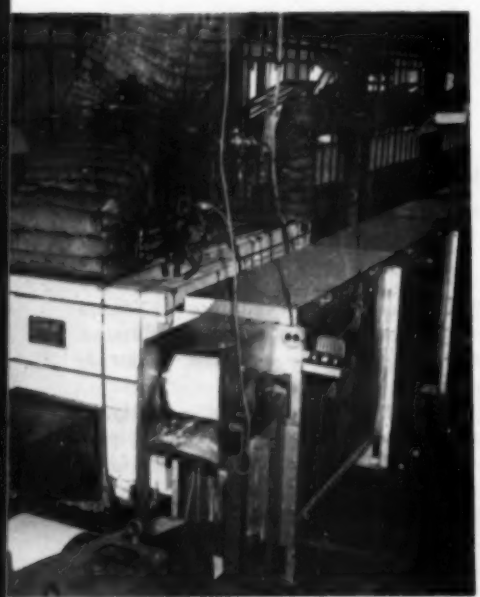
Self-recuperative unit uses part of oxidised gases to heat incoming fume stream indirectly. Fumes are heated to ignition temperature, burner is shut off.

Units are tailored for each job and come completely assembled, except for large units which come in two parts.

Access doors lead to catalyst frames. Temperature rise through unit may be used to find vapor concentration.

the initial fume concentration.

In most heat recovery units fumes enter from the oven and are preheated by gas or electricity. Hot fumes (at about 500 to 700 F) then go through a blower and through the catalyst elements. Exhaust gases are often between 900 and 1000 F (sometimes even 1200 F), and so can be used for heating makeup air with a heat exchanger, or for heating other equipment. Once the unit is in operation, a portion of the hot exhaust gases are fed back to the inlet, to heat incoming fumes to ignition temperature. Preheat burner is then shut off, and the unit becomes self-sustaining. This system recovers not only latent heat, but sensible heat as well. Heat exchangers are always recommended for closed heat-recovery systems.



On an oven, unit may prevent build up of condensate in stack, prevent fire.

Units are always custom built and come as a packaged unit. Unusually large units come in two pieces, but merely require bolting together. Usually, where a heat recovery unit is installed, its cost is completely amortized within one year, depending to some extent on the fuel cost at the point of use.

Not free heat

Of course, you never get something for nothing. In heat recovery units, heat is not supplied free—solvent and heat that were previously going up the stack have already been paid for, and the unit is merely reclaiming this energy. In our case, where we have no heat recovery, all 28 units are continuously fired and act only as fume disposal units.

Our 28 units have required no maintenance at the vendor's factory during six years' use — they still have 75 percent of their original activity, which is more than enough to provide odor-free combustion of our fumes. The 25-percent activity loss was caused by attrition from air and dust particles. We have given our units a yearly maintenance check, heating the catalyst frames to 1250 F in an air furnace to remove contaminants with high ignition points that coat the catalyst. The only other necessities have been good housekeeping on equipment such as blowers and burners and a yearly cleaning of exchanger tubes. We carry only one spare set of catalyst frames for all our 28 units.

All processes have their limitations. This also applies to Catalytic Combustion, which is useful for consuming hydrocarbons, all combustible gases, and most organic vapors. The process is well adapted to disposal of waste gases from most chemical plant operations. In our case, the reliability of operation has prompted more its extensive use. Units are being included with our expanding manufacturing facilities wherever good public relations prompts the need for air pollution control.

I&P EXCLUSIVE

Shell Oil Company

Corrosion of fuel-oil tanks can be a major headache. Moisture condensing from humid air breathed into the tank through vent is the probable cause.

What you should know about FUEL OIL ADDITIVES

DANIEL SCHOENHOLZ and BERNARD BERKELEY
Product Development Department, Foster D. Snell, Inc.

FUEL OIL additives are responsible for the million-dollar saving effected yearly by consumers through reduction in fuel bills, in nonproductive time, and in repair and replacement costs. Rapid increases in the volume of fuel oil used for furnace heating, industrial power, and diesel engines threaten to outpace production during the next few decades.

The growing demand for fuel oils has caused many major chemical manufacturers to take a second look at the potential market for tailormade chemical additives. These chemicals inhibit oxidation, reduce sludge formation, prevent corrosion, eliminate screen clogging, and alter combustion characteristics.

To understand why there is a need for these additives, it is first necessary to know something about chemical constituents and petroleum oil processing. A broad classification of the ingredients found in naturally occuring oil is:

¶ Hydrocarbons — composed primarily of paraffins, cycloparaffins, and aromatics — are the major petroleum components.
¶ Oxygenated compounds — fatty and naphthenic acids and phenols — occur in concentrations up to about three percent.
¶ Sulfur compounds — including free sulfur, hydrogen sulfide, mercaptans, sulfides and disulfides — are found to be as high as five percent in some crude oils.
¶ Nitrogen compounds — based on

alkyl derivatives of quinoline and pyridine — are present in relatively minor quantities.

¶ Resinous and asphaltic constituents — asphaltenes, neutral resins and polymeric substances — vary from 1.5 to 40 percent depending on the oil sources.

¶ Organic metallic components — based on compounds of sodium, calcium, vanadium, nickel, and iron — occur in minor amounts.

Crude petroleum oil is subjected to one of three general refining methods — straight run distillation, thermal cracking, or catalytic cracking. Since the big profit value in petroleum is premium gasoline, producers make it a point to recover as much of the rich volatile fractions as possible. This is very often detrimental to the residual grades used for fuel oil. It is the rule rather than the exception that improved refining processes decrease residual fuel oil quality.

Treatment thus afforded residual oils renders them very susceptible to oxidation and sludge formation. These difficulties are even more accentuated by the accidental occlusion of fresh and salt water. Water concentration in fuel oil, based on authoritative test data, has been increasing over the years. There is reason to believe that water binds together insoluble particles present in fuel oil, thus causing agglomeration and eventual sedimentation.

Small amounts of water in fuel oil are also a primary cause of corrosion in oil storage tanks.

Additives stabilize fuel oil

Fuel oil instability is accelerated by presence of sulfur and nitrogen compounds in oil. These are sulfur, disulfides, and polysulfides; nitrogen derivatives — pyrroles, and traces of oxidation catalysts. There are three general chemical-additive types that have been developed for stabilizing fuel oils. One type includes anti-oxidants, which, by breaking chain reactions, prevent condensation of certain readily oxidizable hydrocarbons to gummy substances. Among these products are cresols, catechol, and more complicated substituted phenols.

Another stability promoter is the metal deactivator. Copper and many copper compounds actively encourage hydrocarbon oxidation with eventual gum and sediment development. Minute quantities of copper are sufficient to accelerate oxidation (as little as a few parts of copper per 10 million can be catalytic). Consequently, any equipment containing copper or copper alloys may be a potential source of trouble. Metal deactivators form stable chelates with dissolved metals, especially copper, thus rendering them noncatalytic. The best known chemical of this type is Du Pont's DMD.

A third group of stabilizers, termed dispersants, maintains solid particles uniformly dispersed throughout the oil. In theory, these dispersants or surface-active agents adhere to the surface of solids, forming a very thin but protective layer around each particle. This film structure reduces attractive forces among the particles, thereby preventing agglomerate formations large enough to settle out of suspension. Various chemicals have been used as dispersants including mineral-oil-soluble soaps, petroleum sulfonates, triethanolamine soaps, naphthenic acid soaps, and nonionic surfactants.

Affect of price on additives

There is a practical limit to additives or treatments that fuel oil suppliers are willing to include in their products without calling for price increases. Users may, therefore, encounter some or all of the difficulties previously mentioned, depending on the fuel oil application. The most serious problems presented are those caused by sludge and corrosion. It is common practice to include a screen or filter in the fuel oil system to insure unobstructed feed lines and clean burner parts. Rapid sediment buildup on the screen interferes

Shell Oil Company

Visual inspection of fuel-oil tank bottom will show extent of corrosion. Corrosion can eat through two-hundredths-inch thick steel plate in 82 days.

with normal functioning of the burner. As little as 2 mg of insoluble gum per 100 ml of oil can cause clogging in the average filter. Correction or alleviation of screen clogging can best be accomplished by combining proper maintenance with the use of additives.

Water contamination is decreased

Water in fuel oil is a potential cause of sludge agglomeration. Every possible precaution should be taken to avoid increasing fuel-oil water content in storage. Storage tanks are vented to prevent interrupted gravity or forced flow. Outside air is breathed or circulated in the tank through these vents. Water droplets condense on the inside of the tank when warm, moisture-laden air is breathed into a tank with an internal temperature lower than outside air. Rain or snow entering the intake pipe can also cause moisture in the tank. Proper storage tank design and the use of filtered breathers can do much to reduce such moisture contamination.

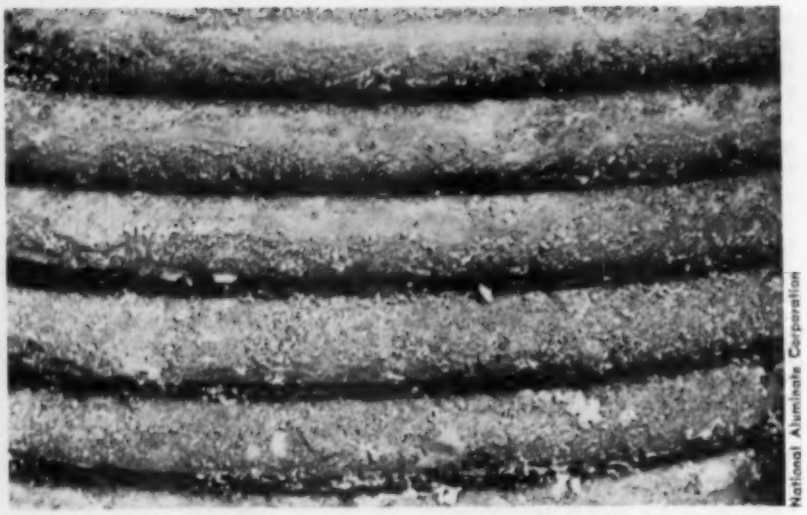
Dispersants contained in many commercial compounds for fuel oil treatment are beneficial in combatting sludge agglomeration. Numerous products are being offered today for this purpose by relatively small manufacturers under local brand names, a lesser number by national distributors.

Fuel-oil additives generally comprise combinations of the following types of ingredients: a mixture of surface-active agents (emulsifiers and dispersants); a solvent or solvents; and a carrier or diluent. Solvents such as aromatic hydrocarbons, chlorinated benzene, and various coal-tar distillates (tar-acid oil, dead oil, and shingle-stain oil), are commonly used. Carriers or diluents are generally kerosene, light fuel oil, or other inexpensive petroleum fractions.

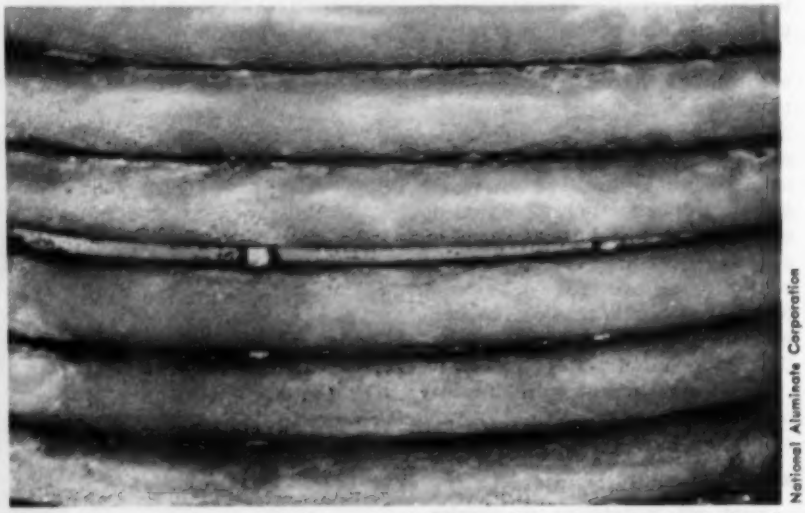
Active dispersant chemicals

Active dispersant types cover a fairly extensive list of chemicals including polyethylene glycol ether condensates, sodium, barium, and calcium salts of petroleum sulfonates, plus metallic salts of oxidized petroleum.

It is necessary to select agents that have maximum surface activity, since effective fuel-oil sludge treatment depends upon emulsifying and dispersing power. To obtain optimum emulsification and stable dispersion, however, it is necessary to have mechanical agitation or action. This is not easily obtained in an oil-storage tank, and compromise has been the rule. Most manufacturers recommend that the storage-tank oil level be reduced as low as practicable before adding the treatment compound. On refilling the tank, the entering oil causes some turbulence and agitation that improves mixing of the compound. This promotes better emulsification of existing sludge in the tank, as well as of sludge contained in the new oil. To alleviate troublesome sludge deposits in No. 6 fuel-oil tanks, the recommended practice is to bunker the new oil through a pipe reaching nearly to bottom. Scouring action of the new oil stirs up any settled material.


National Aluminate Corporation

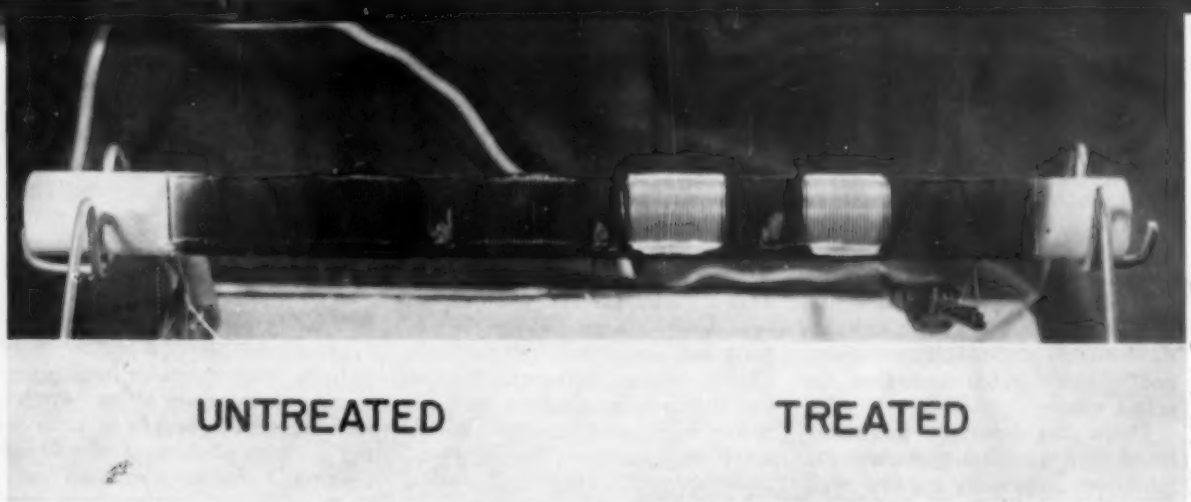
Heavy soot and slag formations on tubes of a package boiler that has been burning untreated fuel oil reduce heat-transfer rate and boiler efficiency.


National Aluminate Corporation

Same tubes as in photograph above after boiler has been continuously fired with fuel oil that has been treated with one gallon of chemical/1000 gallons of oil.

Are dispersants effective?

A recent paper issued by the Bureau of Mines raises some question regarding the effectiveness of sludge dispersants for No. 6 fuel oil.



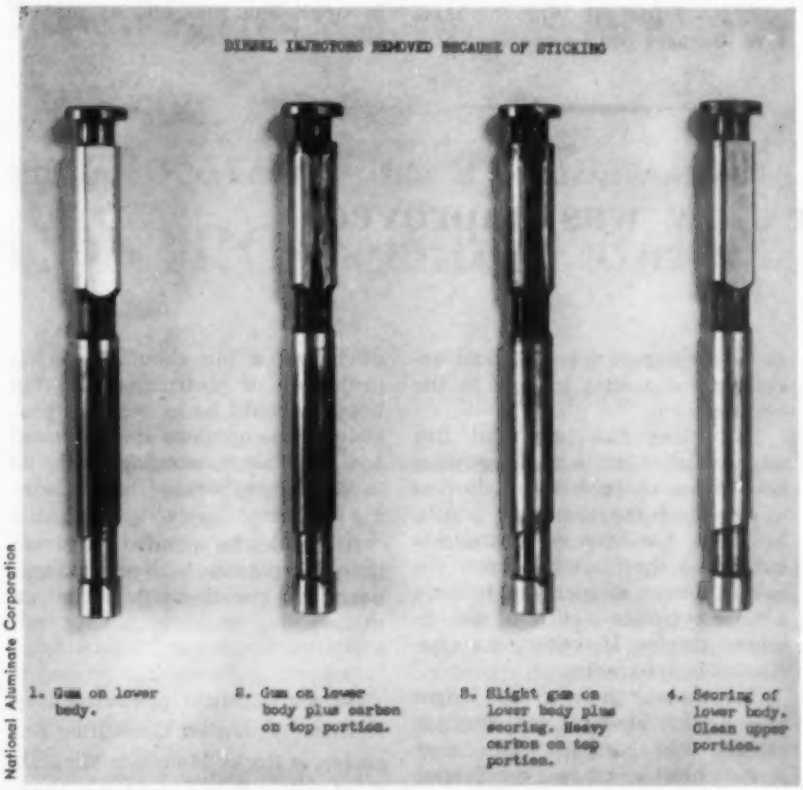
National Aluminate Corporation

Both electrical coils were deliberately sooted. One coil was sprayed with treated fuel oil — soot burned off when heated.

The following paragraphs have been reprinted from that report:

"It may be argued that some additives cause the sludge sediment to be more fluid, since an additive may perhaps delay consolidation of the sludge into an especially viscous mess. However, the additives did not retard sedimentation; and the sediment in additive-treated tanks was no less troublesome, was no more pumpable, and had a composition generally no different from the sediment in tanks that were not treated. Also, in some instances the quality of sediment precipitated from an oil was increased by a contribution from the additive.

"Chemicals were found that, even in low concentration, delayed the sedimentation of water and of some kinds of dirt. It is not recommended that these chemicals be compounded with additives, however. Their effectiveness is uncertain, depending on careful control of relative concentrations and other factors that are not practically achievable in industrial application. Also, the present price of such treatment would be high compared to the cost of the oil."


DIESEL INJECTORS REMOVED BECAUSE OF STICKING
1. Gum on lower body.
2. Gum on lower body plus carbon on top portion.
3. Slight gum on lower body plus scoring. Heavy carbon on top portion.
4. Scoring of lower body. Clean upper portion.

National Aluminate Corporation

Unstable oils may cause diesel injectors to stick for a variety of reasons. With proper stabilization, injectors remain clean and operate efficiently.

Corrosion in oil storage tanks is an insidious problem because it is difficult to detect the process before extensive damage has occurred. The increasing frequency of leaks in fuel oil tanks is a cause for alarm for all consumers. The major cause of oil tank corrosion is the presence of water, which is almost always acidic due to compounds containing sulfur in the oil. Both the producer and the consumer can minimize corrosion by using corrosion inhibitors. An effective corrosion inhibitor forms a blanket over the metal surface, preventing metallic contact with the corrosive agent. Blanket thickness ranges from one molecule to millions of molecules, depending on the inhibitor used.

Oil solubles control corrosion

Chemicals used to control corrosion in petroleum are principally oil-soluble compounds such as metallic organic salts of petronic acids, organic phosphorus derivatives, and nitrogen-containing compounds. The efficiency of these products depends upon their ability to displace water and to orient on metal surfaces. This process is known as chemisorption.

Some corrosion inhibitors for fuel oils are preferentially soluble in water rather than in oil. These chemicals dissolve in water that is present as small droplets or as a discrete lower layer in fuel oil. The best known water-soluble corrosion inhibitors are the nitrite salts in combination with alkalies—borates and silicates which neutralize the acidic water.

There has been an increasing trend toward ashless-type corrosion inhibitors, especially for use with light fuel-oil distillates and diesel fuel oils. Examples of these inhibitors are: glyceryl and sorbitan fatty acids, ester derivatives of phosphoric acid, and ammonium sulfonates.

Improve combustion control

Definite advancements in combustion improvement have been achieved in diesel fuel oil. In contrast to gasoline, a diesel oil that knocks makes the best fuel. This knocking property measured by comparing the knock tendency to the knock tendency of a known mixture of cetane and alpha naphthalene. The diesel oil is then rated by a cetane number, which is numerically equal to the percent of cetane in the known fuel mixture.

Straight-run distillates have cetane numbers ranging from 33 to 68, depending upon the hydrocarbon composition. Paraffins rate the highest in cetane, aromatics the lowest. Ignition or cetane improvers are used with many light diesel fuels that have low cetane numbers. This alters the combustion characteristics by increasing the tendency to knock. Some of the better known diesel-fuel additives are ethyl nitrate, amyl nitrates, and acetone peroxide.

Reduce carbon deposits

Combustion additives are used in furnace fuel oils primarily to reduce carbon deposits and minimize fuel oil smoke. Organo-metallic compounds of lead, zinc, and copper are known to lower the ignition temperature of carbon particles. This causes them to burn readily at normal flue and firebox temperatures. One such patented product is a combination of petroleum acid metallic salts with halogenated hydrocarbons. A new additive called DCPI reduces smoke formation when 0.1 percent by weight is used with No. 2 fuel oil. With this mixture, burners can be operated at a fuel-air ratio 20 percent higher than normal, without producing increase in the smoke output. Thus, by operating with a richer fuel mixture, thermal efficiency is considerably improved.

More research is needed

Increasing demand for recovery of high octane fractions from petroleum will motivate more complex technological advances in processing methods. This, in turn, will decrease the quality of residual fuels. Since demand for residual fuel oils is increasing, there is a need for continued basic studies by industry along these lines:

¶ Developing improved test methods for predicting fuel oil behavior in storage and in use;

¶ Investigating factors that contribute toward instability and sludge formation;

¶ Determining the mechanisms of combustion and flame propagation;

¶ Evaluating new chemicals for their effect as fuel-oil additives.

The inferior quality residual fuel oils, resulting from manufacturers' desire to get more light fractions, will increase the problems involved in upgrading fuel oils by use of chemical additives.

How coal bunker flow was improved

A SYSTEM OF beams, shelves and ledges has been installed recently in a coal bunker at the Raritan River Plant of the Jersey Central Power and Light Company in New Jersey. Burns and Roe, Inc. of New York Ctiy are engineers for the project. . . . There are two levels of shelves and beams in the vertical part of the steel bunker. The shelves are attached to the bunker walls and the beams span the width of the bunker and divide it into four compartments. Close-spaced ledges are welded to the hopper walls. The purpose of the ledges is to increase friction between the walls and coal and thus to prevent bodily slip of coal which produces impact pressures and excessive compaction of coal in the hoppers.

The plant has now had five months of operation. There has been some obstruction to flow at and beyond the discharge points, but there has been no obstruction evident in the bunker proper. We need a winter of operation to form a more complete picture of the obtained results. However, one conclusion is apparent:

The beams, shelves, and ledges have neither hindered coal flow nor caused coal hangups. This may sound like a trivial conclusion, but it is not, in view of the widely held opinions that, to obtain good discharge, a bin should have no projection or obstruction and the hopper should be as steep as possible. These opinions are disproved and this, alone, should enable us to design cheaper and better looking bunkers.

It should be pointed out that there are patents, both granted and pending, covering the use of shelves.

—From a paper presented by Andrew W. Jenike, Consulting Engineer, at Rocky Mountain Minerals Conference, Salt Lake City, Utah, October, 1955.

Simplicity and flexibility of plug-in permits configurations tailored to the particular requirements of any plant.

Square D practices what it preaches about

CONTROL centers and PLUG-IN duct

I&P EXCLUSIVE

HAROLD A. BERGEN
Editor

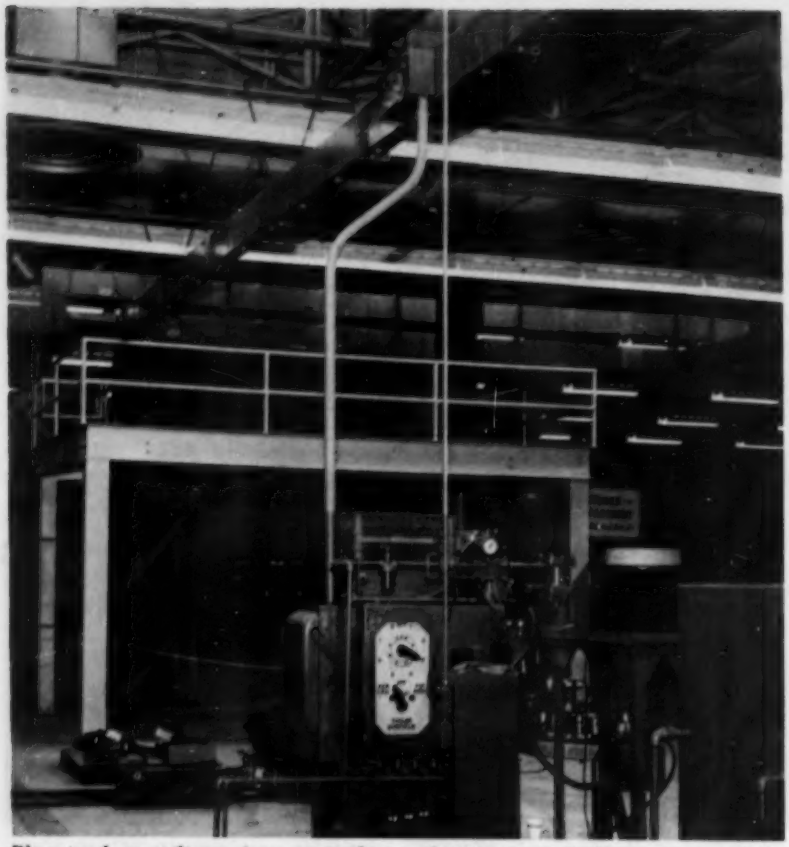
YOU CAN LEARN a good deal about modern electrical distribution practice for industrial plants by looking at the new Cedar Rapids plant Square D built for itself this summer. By following the system practices and equipment application recommendations it has been advocating, Square D has given itself the kind of versatility and flexibility that is its own stock in trade.

Two aspects of the Cedar Rapids plant's electrical system are particularly good examples of preachment in practice. First, there is the use of plug-in duct to supply secondary loads with adequate power via conductors having adequate current-carrying capacity. This is coupled with adequate flexibility, to add load and alter plug-in duct runs with high salvageability and minimum downtime.

Second, there is use of motor-control centers, particularly for the boilerroom, that amply demonstrates the benefits of concentrated control removed from the controlled-equipment site.

Power enters the plant through a 2500-kva outdoor substation at 34 kv. Metering is done on the 34-kv side with equipment owned by Square D. From the outdoor substation, the power goes into the plant at 7200 volts through a 100-foot underground fiber-in-conduit run. Shielded single-conductor cable is used here.

The incoming 7200-volt line enters the rear of the building at the main indoor substation through a 400-ampere fused switch. From this point, power fans out in three



Plug-in duct radiates from secondary substation on platform supported by stilts. Tapoffs to machines are through plug-in breakers and conduit runs.

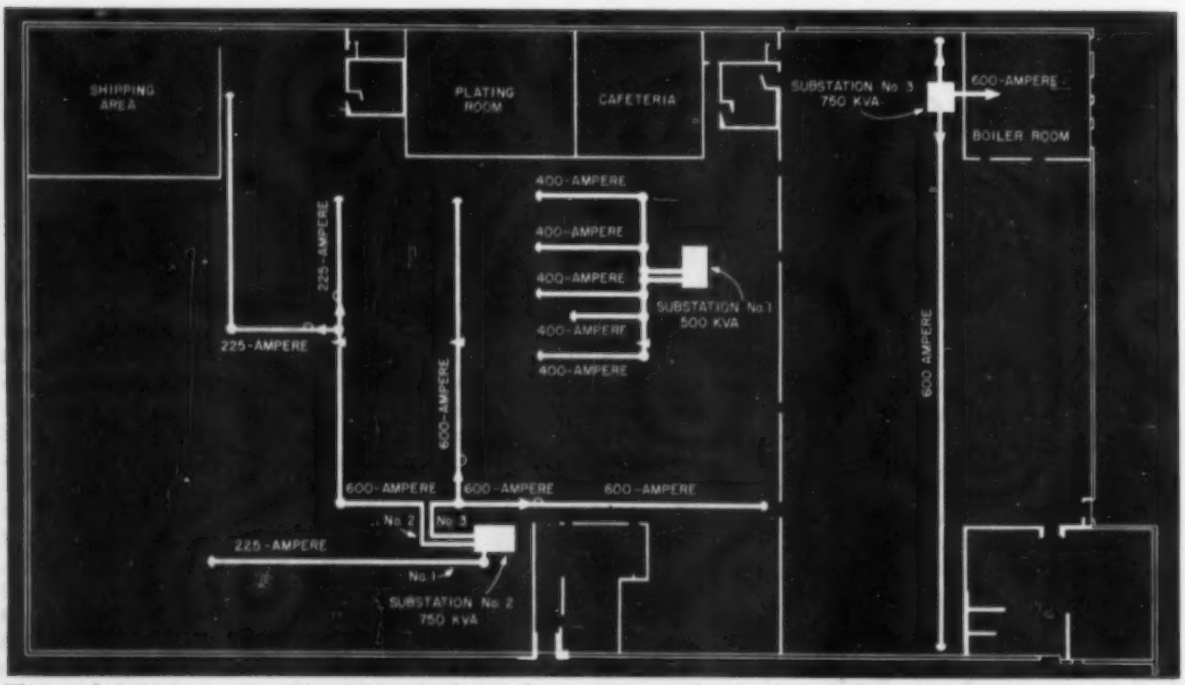
radials to three unit substations in the plant. Varnished-cambric single-conductor cable feeds these substations.

Substation location

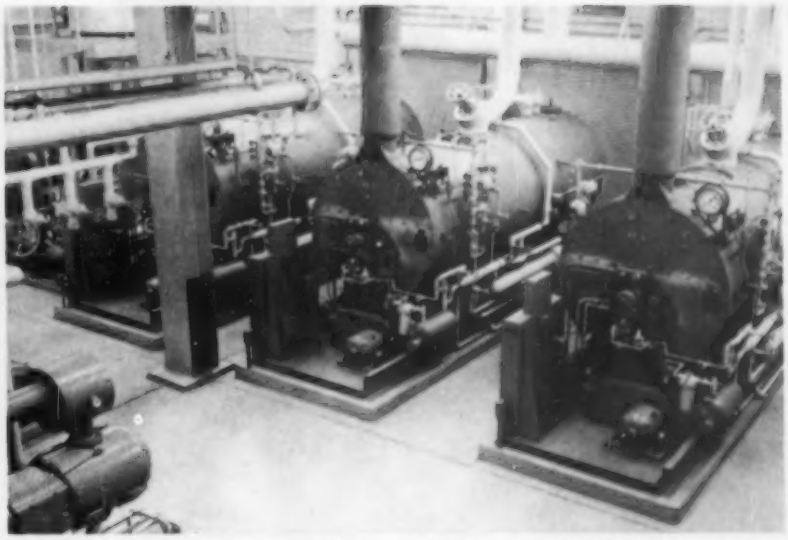
Substation No. 1 is located near the center of the plant, and is rated 500 kva. It is mounted on a raised platform some eight feet above an aisleway in the manufacturing area. It supplies five 400-ampere runs that are comparatively short. Four of them extend but 42 feet each, and the fifth is 28 feet long. This somewhat unusual arrangement, plus a special low-impedance transformer, was essential to insure the best bossible voltage regulation for critical resistance-welding machines located in this area.

Substation No. 2 is above office area near the front center of the building. It is rated 750 kva, and supplies three main plug-in duct runs. These runs fan out over the plant manufacturing area not covered by Substation No. 1.

Substation No. 3, rated 750 kva, supplies the boilerroom and some office areas. This substation, the main indoor substation, and the motor-control center for the boilerroom equipment are all located in



Three substations are spotted in plant to feed secondary power to plug-in duct. Substations are above floor level.



Control center (left) is separated from boiler room (above) by picture window. All startup can be done at control center with boilers in full view.

a continuous cubicle — in turn housed in an enclosed switchgear room next to the boilerroom. This makes an attractive, safe, convenient grouping of the major controls for the power services feeding the plant.

An extra element of convenience is added by separating the switchgear room from the boilerroom by a picture-window wall. Though the boilerroom is separated from the main switchgear room, the operator can work the boilerroom motor-control center while watching the boilerroom through the window.

Plant power load is now 750 kva plus 250 kva of connected lighting. The low-voltage control lighting system is in itself another example of modern practice preached as well as practiced by Square D. Pushbuttons on the wall operate, through 110-volt lines, 480-volt contractors for general plant lighting. Plant lighting is fed by a 277/480-volt fluorescent system, a system being used in many modern plants today. Office lighting is fed by 110-volt power controlled through 24-volt controls, relays, and switches.

Corollary to the 277/480-volt lighting system is a grounded power system. Square D followed the modern trend in this matter, too. A ground mat of 500,000 mcm conductor underlies the entire general area covered by the 110,000-square-foot plant. The mat is brought up through the floor and stubbed to every building column.

All indoor substation transformers are Allis-Chalmers ventilated dry types. Power factor correction is achieved through synchronous motors driving refrigeration equipment and an air compressor.

Future expansion is already planned for this plant's electrical system. A 7200-volt line will be run from the main indoor substation directly to a fourth secondary substation, to feed laboratory testing facilities. Other expansions will be easy when necessary—either in terms of increased load per square foot of existing plant area or in terms of increased plant area itself. For Square D in practicing its own precepts has given itself the benefits of modern electrical distribution — flexibility and adequacy consistant with economy.

You can prevent synchronous motor failures

The intent of [our] analysis is to bring to [your] attention the kinds of things that cause synchronous motor failures. . . .

Each installation must be engineered individually for proper lightning protection. . . . Specialists have found that there is no "cure-all" which can be applied generally, but that a careful study of conditions existing at each location must be made. . . .

Adsorption of a relatively small amount of moisture by the insulation of electrical equipment will often set up hazardous conditions that may cause a serious failure. . . . Electrical failure of the insulation is generally preceded by the mechanical breakdown of the insulation. Many such failures can be prevented by thorough examinations of the condition of the windings by men who are trained to know the weak points and who can recognize the symptoms of impending failure.

Failures due to overloading can be reduced, if not entirely eliminated, by insisting that nameplate current values shall not be exceeded. It must be kept in mind that the heating effect varies as the square of the current; hence, even small increases in ampere loads mean relatively large increases in heating. . . .

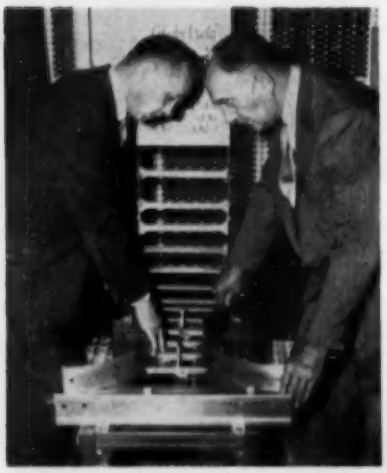
Failures due to improper lubrication can be materially reduced. The oiler must be made to realize that excessive lubrication can cause failures of ball and roller bearings as does lack of lubrication on all types of bearings.

. . . The Locomotive of the Hartford Steam Boiler Inspection and Insurance Company

Cleaver-Brooks showed this self-contained four-pass boiler rated 125 to 150 hp. It delivers steam at 15 to 250 psi, hot water at 30 psi.

R. B. Pleiman, Gustav Wiedeke, describes ball-bearing, adjustable thrust collar tube expander.

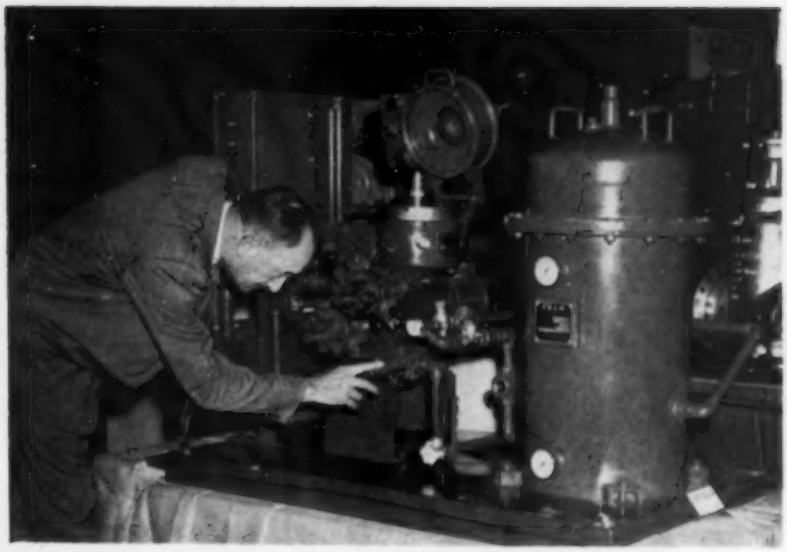
I&P takes you to the POWER SHOW



H. M. Donnelly, Globe, explains how new cable tray cuts costs 25 percent.

L. C. Stybr, Magnetrol, describes magnetic principle of level control.

Impeller and cutaway of casing for barrel-type boiler feed pump was shown by Allis-Chalmers. Balanced thrust design gives radial and axial balance.



Part of DeLaval Separator exhibit was this insulating oil purifier. By using centrifuge principle, dehydration becomes simple, inexpensive and rapid.

Hewitt-Robins displayed automatic bin-level control using radio signal.

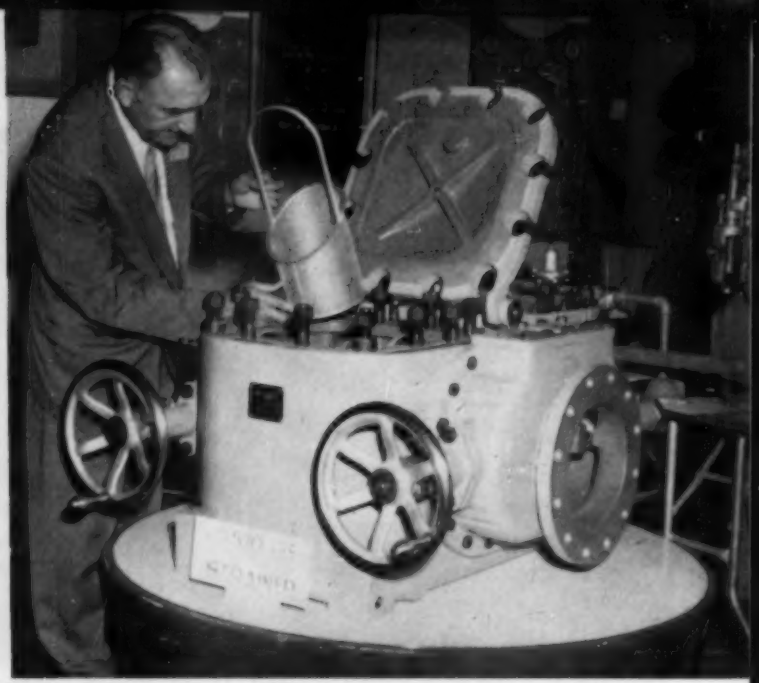
Come with INDUSTRY & POWER to the Power Show just concluded in Chicago. J. A. Tomasek, a fellow reader of yours will take you around to see the outstanding exhibits on display. Tomasek heads Utility Engineering at Corn Products Refining Co.

General Radio demonstrated Variac control for dc motors supplied by ac.

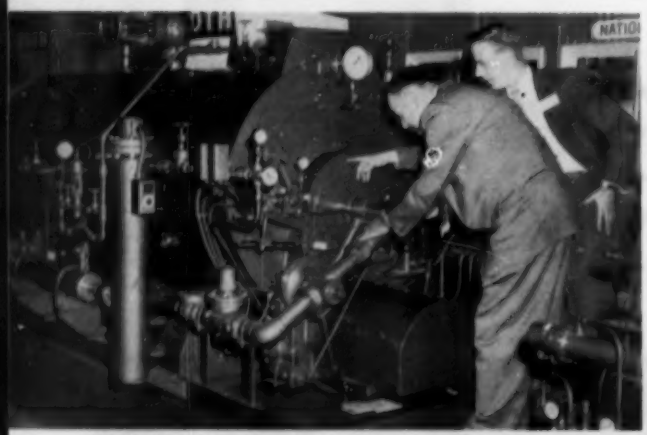
Pressure-containing ability of high-pressure rubber-seat butterfly valve was shown by L. C. Von Moll, Henry Pratt.

Cutaway model of control valve with Isoforce operator, made by Foster Engineering, showed operating principle.

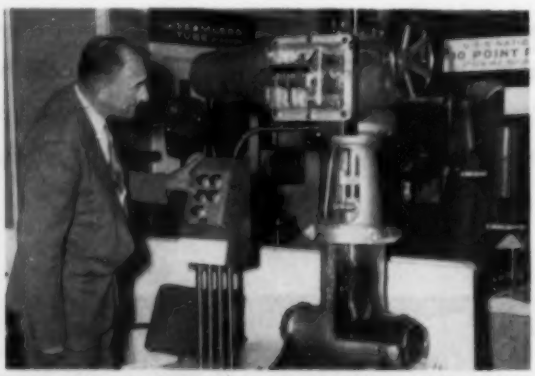
John Rodeno shows cutaway models of Hydro-Flex, and float and thermostatic steam traps.



Emphasizing trend to pipeline cleaning, J. A. Zurn showed automatic, self-cleaning, duplex strainer featuring low pressure drop.

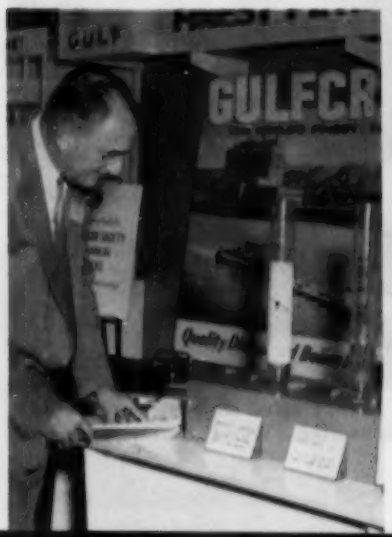


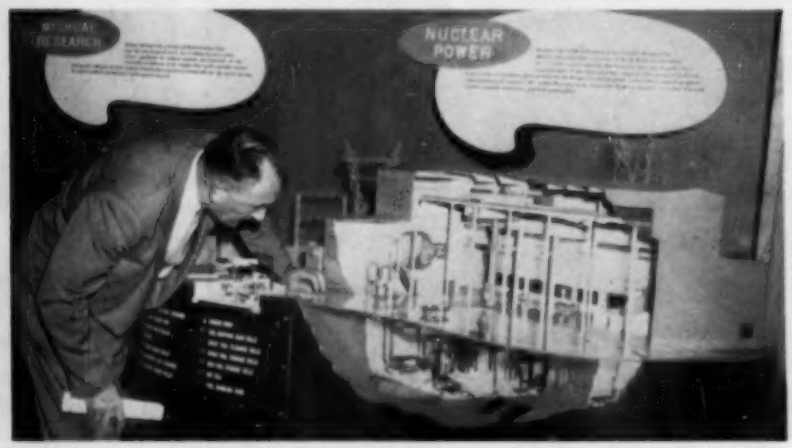
Cyclotherm displayed 80-hp package steam generator for light-oil, heavy-oil, gas, and oil-gas combination.



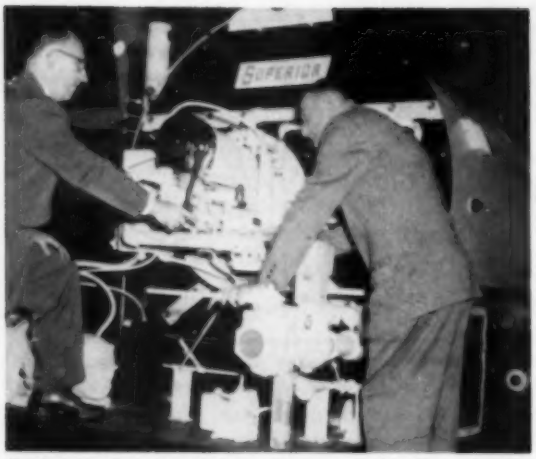
Gate valve by Crane was connected to Philadelphia Gear Limitorque operator with Westinghouse control.

Turbine oil without antifoam agent (left) and with (right), by Gulf Oil.





Sodium-graphite reactor plant rated 75,000 kw was displayed by North American Aviation as part of a special Power Show section on nuclear power.



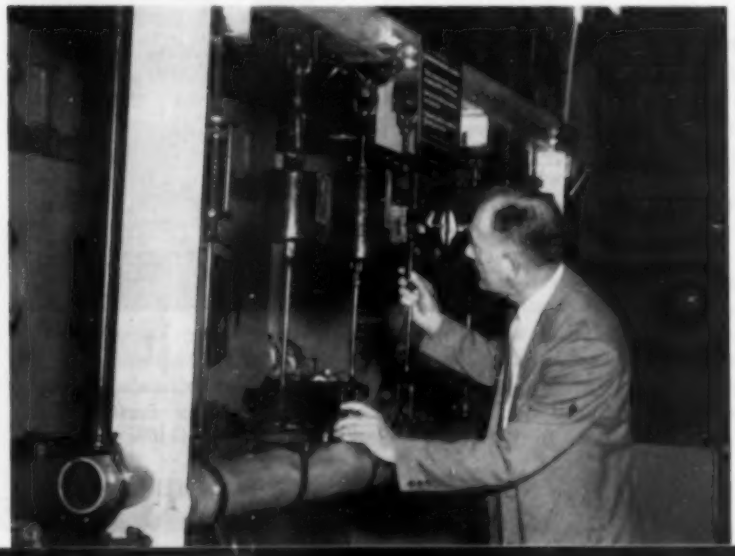
Package fire-tube boiler shown was by Superior. It delivers 150 hp at 125 psi, fully automatic fired.

American Gilsonite had actual sample of installation plus this wall model to demonstrate underground pipe insulation.

Charles E. Gallear, assistant chief engineer, Buell, operates model of continuous-rapping, Spiralectrode collector.

Part of the exhibit by Fairbanks-Morse was this cutaway model of their four-inch trash pump.

Grinnell had an extensive display of many models of their pipe hangers.



Copes-Vulcan showed model of 120-unit panel for selective-sequence soot blowing.

	Sales		Power Facilities	
	Dollars	Percent	Dollars	Percent
Gross income	108.95	(100)	125.00	(100)
Cost	100.00	91.8	100	80
Profit before taxes	8.95	(8.2)	25.00	(20)
Depreciation (straight line)			5.00	4.0
Profit before taxes including depreciation	8.95	(8.2)	20.00	(16)
Taxes	4.15	3.8	9.30	7.4
Profit after taxes	4.80	4.4	10.70	8.6

Fig. 1—Comparison of profits for hundred dollar investment in sales and power facilities. Less profit is obtained using alternate depreciation methods.

I&P EXCLUSIVE

STEAM and POWER . . . PROFITS and TAXES

MICHAEL POPE, Consulting Engineer

Michael Pope graduated with the degree of Bachelor of Science in Electrical Engineering from City College of New York. He spent three years in the U. S. Maritime Service, and held a First Assistant's License upon discharge. His professional experience includes consulting work as an associate of the late David Moffat Myers. He organized his own consulting firm in 1954 with the principal objective of reducing to a minimum the cost of heat and power requirements for manufacturing and plant use. Pope has been active in process industries for the past 10 years.

CAPITAL INVESTED in Power Service expansion and modernization can be made more profitable than the same dollars invested in sales and production by utilizing tax consultants, and by incorporating up-to-date instrumentation and operating methods. A recent report issued by the Securities and Exchange Commission states that the average net profit of approximately 9000 corporations, per dollars of sales, before taxes, was 8.2 percent. And net earnings after taxes were 4.4 percent (Fig. 1). In other words, taxes averaged 46.5 percent of net profit. (Actually, individual corporation profits above $25,000 are taxed at the rate of 52 percent). By investing the same amount in the improvement of steam and power facilities (Fig. 2), the average net profit before taxes, including depreciation, would be 16 percent. And, the net earnings after taxes would be 8.6 percent.

This type of income continues year after year without further investment, whereas sales income is dependent upon the continuance of large annual expenditures.

A graphic representation of the two types of investments, on the usual basis of return of investment in four years, is shown in Fig. 3.

Use advantageous rate

The actual profit depends greatly on the depreciation method allowed. In the preceding charts, the straight line method has been used on a 20-year basis, which results in a $5 annual depreciation allowance on a $100 capital investment. Until 1954, business property depreciation methods were restricted to the straight line method, or to any other method that would not result in greater deduction than the straight line method.

Under the Revenue Act of 1954 (Sec. 167), new rules were promulgated to give the taxpayer a greater depreciation deduction in the early years. These new rules apply to

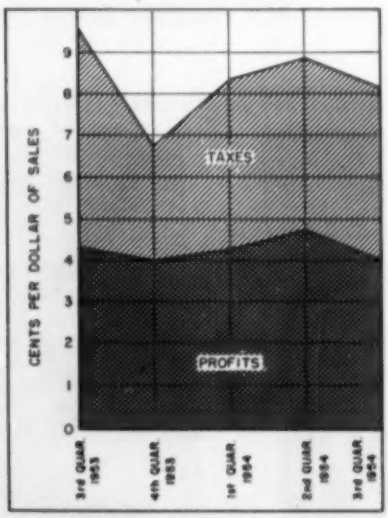


Fig. 2—Sales and production profits and taxes for typical ($100) investment.

assets that have a useful life of three years or more, including:

¶ New (not used) tangible property acquired after December 31, 1953;

¶ Property built, altered, improved, or reconstructed after December 31, 1953. (If construction of such property was begun prior to January 1, 1954 but completed after December 31, 1953, the new rules apply only to that portion of work performed after December 31, 1953.)

The new law specifically provides for two depreciation methods other than the straight line method.

A fixed percentage (double the straight line rate) is taken each year of the asset's declining book value. As the following table shows, under this method only 88 percent of the original cost is recovered for a 20-year asset through depreciation. This 12 percent is, theoretically, the scrap value. It also can be realized as an ordinary loss by sale or abandonment at the end of useful life. The taxpayer may switch to the straight line method at any time during the life of the asset.

Sum-of-the-digits method

The rate applied to the asset is computed by adding up all digits representing years in the asset's useful life—this is the denominator. The numerator is the number of years of useful life remaining, including the year for which the depreciation is taken.

For example, for an asset with a 20-year useful life, the first year's depreciation would be 20/210, the second 19/210, then 18/210, through 1/210. Unlike the declining balance this method allows full cost recovery through depreciation.

In addition to the above depreciation methods, the taxpayer may elect to use any other reasonable method, provided that it is consistently applied. And at no time during the first 2/3 of the asset's useful life can the cumulative cost recovered be greater than that recovered under the fixed percentage of declining balance method.

After 10 years (half-life), 50-percent cost recovery under the straight line method, 65-percent recovery under the declining balance method, and 74-percent recovery under the sum-of-digits method has been achieved, (Fig. 4). Note also that after 1/4 of the useful life, the fixed percentage method and the sum-of-digits method have both recovered the same cumulative cost. For all subsequent years, the latter method recovers cost at a much faster rate, and completely outdistancing both the straight line and declining balance methods.

Tax advice is deductible

Tax laws give the plant owner another special advantage. He can obtain authoritative tax accounting services for a fraction of their usual cost, a large percentage being absorbed as expense against taxes. Cost of effecting economical operation methods can be almost entirely charged to expense for income tax reduction. Savings are usually very substantial.

Steam generation for process and space heating is invariably an individual plant operation. Two major factors contributing to high steam-production cost are fuel and labor. Older boiler plants can easily consume their first cost twice a year on these two items. Proper accounting is one sure way of knowing where fuel dollars are going and if any waste is involved.

A single modern boiler can often replace three or four old units with a resultant labor savings as well as an appreciable fuel cost reduction. Automatic controls and modern fuel handling equipment reduce fuel consumption and permit use of cheaper grades of fuel.

Where do these plant improvement opportunities exist? Right in the steam and electric power systems. It does not matter whether these utilities are purchased or generated.

Certain instruments are essential to assure that correct operational procedures are being followed. Several well-placed meters and

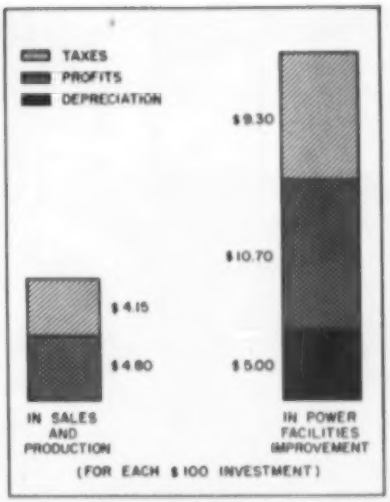


Fig. 3—Graphic sketch of profit-taxes with four-year investment return.

Year	STRAIGHT LINE Annual Depreciation	STRAIGHT LINE Cumulative Depreciation	DECLINING BALANCE Annual Depreciation	DECLINING BALANCE Cumulative Depreciation	SUM OF THE DIGITS Annual Depreciation	SUM OF THE DIGITS Cumulative Depreciation
1	5	5	10.0	10.0	9.5	9.5
2	5	10	9.0	19.0	9.0	18.5
3	5	15	8.1	27.1	8.6	27.1
4	5	20	7.3	34.4	8.1	35.2
5	5	25	6.6	41.0	7.6	42.8
6	5	30	5.9	46.9	7.1	49.9
7	5	35	5.3	52.2	6.7	56.6
8	5	40	4.8	57.0	6.2	62.8
9	5	45	4.3	61.3	5.7	68.5
10	5	50	3.9	65.2	5.2	73.7
11	5	55	3.5	68.7	4.8	78.5
12	5	60	3.1	71.8	4.3	82.8
13	5	65	2.8	74.6	3.8	86.6
14	5	70	2.6	77.2	3.3	89.9
15	5	75	2.3	79.5	2.9	92.8
16	5	80	2.1	81.6	2.4	95.2
17	5	85	1.9	83.5	1.9	97.1
18	5	90	1.7	85.2	1.4	98.5
19	5	95	1.5	86.7	1.0	99.5
20	5	100	1.3	88.0	0.5	100.0

Fig. 4—Comparison of depreciation methods based on a twenty-year asset life. Complete depreciation is not obtainable under the declining balance method.

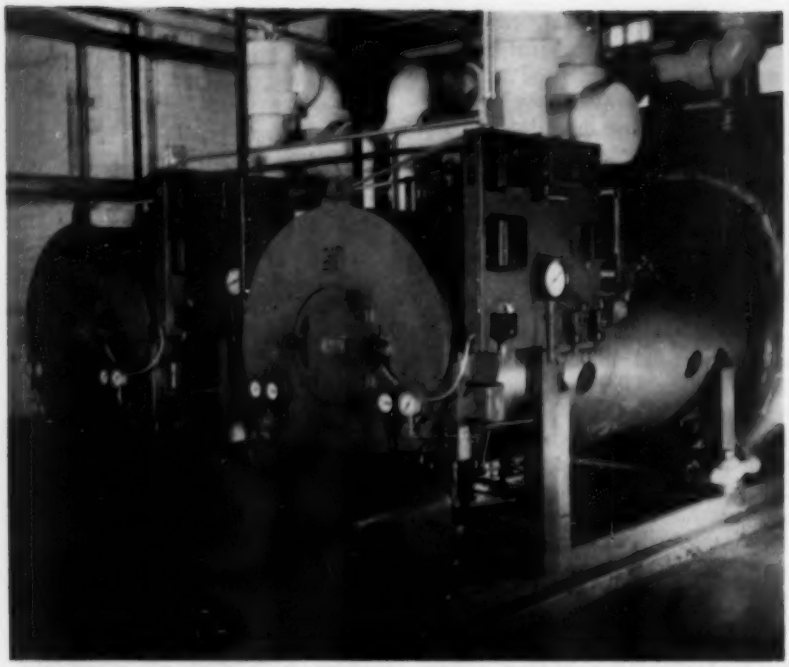


Fig. 5—Typical of recent, modern, package-boiler installations, complete with instrumentation to permit accurate control and determine operating cost.

Fig. 6—Typical of older, hand-fired installations. Lack of adequate instrumentation made accurate, efficient operation a matter of individual ability.

gauges can accomplish some remarkable results.

The often maligned and seldom understood steam trap is another fuel saver. Properly installed and periodically maintained, this fitting can pay for itself in a matter of months.

Boiler feedwater is a major raw material. The pumping and conditioning cost is a vital dollar item. In attempting to develop economies, it is important to first determine the cheapest supply source. A comparative cost analysis of river, well, and municipal supply is essential.

Purchased vs in-plant generation

Much has been written on the comparative merits of purchased versus generated electricity. The answer still depends on individual plant requirements. Some mills that went overboard on byproduct power installations now find that the ever-increasing trend toward process equipment electrification has considerably altered their heat balance. It is now cheaper to purchase at least part of their needs. On the other hand, there are still many plants using low-pressure process steam or having cheap fuels available that should be generating their own electric power.

Distribution and use of electrical power is an additional savings source. An obsolete network with low distribution voltage can waste money and hamper expansion. It may jeopardize production in the entire plant.

Purchased-power bills can often be reduced by control of demand, load factor and power factor. Other economies are possible by taking advantage of power rates and special rebates during off-peak periods, and by owning transformers or standby equipment.

American industry has not taken full advantage of the specialized knowledge available in outside consulting groups. Many plant managers feel that their own resident staff should be able to cope with all problems pertaining to power costs. These men, however competent, are burdened with the everyday tasks of keeping the plant operating. They cannot become expert in the specialized knowledge required without neglecting their daily responsibilities.

An objective viewpoint, coupled with the ability to devote undivided and concentrated time on a particular project, can bring immeasurable benefits in terms of smooth operation and increased output — and most important — in the annual balance sheet.

One Answer

...for EVERY Small Forged Steel Gate Valve Application

Chapman List 960

If you want a small gate valve to control pressures from 380 pounds at 1000°F to 2000 pounds at 100°F . . . if you want low cost operation under the most grueling of conditions . . . if you want top valve performance . . . specify Chapman List 960. It's the forged steel gate valve that's the popular choice for a wider variety of applications than any other comparable valve on the market today.

Here's the reason why:

Chapman List 960 is tough

It has wedge faces hardened to 800 Brinell by the exclusive Malcomizing process to prevent seizing or galling. Replaceable hardened stainless steel seat rings assure tight closing and smooth operation. Snug seating permits full pressure repacking. Extra strong stem and gate connections take unusual stresses.

Chapman List 960 is versatile

It's available in all standard sizes from ¼" to 2" with screw or welding ends, and in two types, rising stem with yolk and rising stem with inside screw. Made in various alloys and combinations of alloys, the Chapman List 960 guarantees reliable performance over an unusually wide range of applications.

Whatever your needs for small forged steel gate valves the Chapman List 960 can do the job better and at lower operating cost. For higher pressures specify Chapman List 990. Write today for Catalog 10 and get full details.

The CHAPMAN Valve Manufacturing Company
INDIAN ORCHARD, MASSACHUSETTS

Circle 117 on READ-N-CIRCLE card for more data

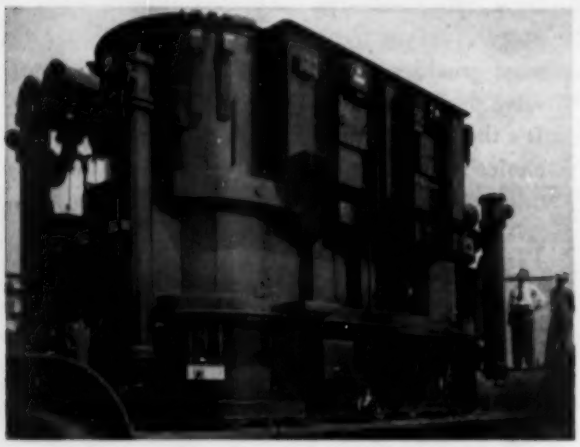
ideas in action

. . . starts on page 32

treme heat to which they were subjected. A two-pole Gleason S-300 reel was installed, which pays out and retrieves 150 feet of two-conductor No. 8 electric cable to carry power to the locomotive motors. It has worked satisfactorily without any replacement of parts or repair service since installation two years ago.

More power output, more water throughput

Water will be pumped through heat exchangers at a rate of over 700 gpm to cool a huge power transformer recently completed by General Electric Company. Heat ex-



changers will cool transformer's 9540 gallons of insulating oil. Unit is largest of its type ever built by GE, and is rated 275,000 kva — enough electric power to supply the needs of a city of about 660,000 people. Giant transformer weighs 222 tons and stands over 20 feet high without its bushings. It will be installed at the Cleveland Electric Illuminating Company's new Eastlake Power Plant, 20 miles east of Cleveland, Ohio.

Insulation for OVEC plants

Fiberglas and Kaylo insulation, both supplied by Owens-Corning Fiberglas Corporation, are being applied on pipes, breechings, boilers, and ducts at Clifty Creek and Kyger Creek Stations. Kaylo insulation was installed in two layers, one 2-inches thick, and the other 1½-inches thick, both impaled over No. 9 gauge pins. Fiberglas was installed in 2 layers, each 2-inches thick, again impaled over No. 9 gauge pins. Pins were installed with rods and by the Nelson stud welding method. Outside, on breeching, a heavy elastic fibered coating was sprayed over glass-fabric reinforcement that covers fiberglas special duct installation. Aluminum jackets were installed over

Kaylo insulation on hanger rods that support the boilers to protect plant personnel. Both stations belong to the Ohio Valley Electric Corporation, and will supply power needs of the Atomic Energy Commission's new $1150 million uranium diffusion plant near Portsmouth, Ohio. Together, they will have a capacity of 2,365,000 kw.

Plastic paint stops peeling problem

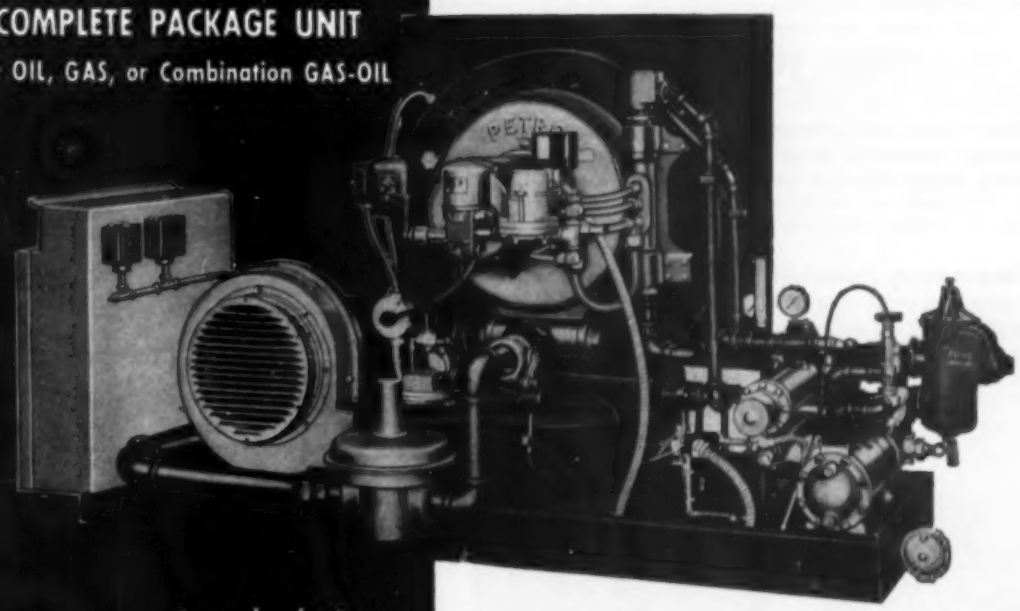
Peeling and blistering of paint in refrigerated rooms at the Hotel Roosevelt, New York has presented an annoying and costly maintenance problem. The rooms have plaster ceilings, which formerly were painted with a white alkyd enamel for appearance and brightness. Rooms could not be kept out of service long enough for ceilings to dry adequately before paint was applied, or for the paint to dry completely afterwards. Usually, refrigeration equipment was shut off temporarily while the ceiling was painted. After a few hours (to permit some drying) the room had to be returned to service. As a result, the alkyd-paint film dried and cured at a very slow rate. After three or four month's time, the freshly painted surface began to peel again. Early this

MAKE BOILER ROOM SAVINGS
A REALITY WITH A

Petro

COMPLETE PACKAGE UNIT
for OIL, GAS, or Combination GAS-OIL

a perfectly balanced firing system in ONE factory-assembled and tested unit



. . . just bolt it on and make service connections —*it's ready to go!*

Send for free literature

Here is the *sure* and *economical* way to convert your present boilers to automatic firing. Petro package burners fit almost every existing boiler and meet any load requirement. Each unit includes the burner (whether for oil, gas, or combination gas-oil,) fuel system, forced draft air supply, control panel, and preformed refractory combustion chamber. You save money because all parts come to you completely balanced and integrated ready to go. There's no long and costly on-the-job engineering.

Enclosed Control Panel

Neat, safe, and complete—the Petro control panel is totally enclosed, with all instruments wired and tested at the factory. Can be attached to frame as shown, turned 90° or 180° or mounted elsewhere in the boiler room.

Low Fuel Cost

OIL—Petro's highly efficient horizontal rotary oil burner is adaptable to the entire range of fuel oil grades. Exclusive Petro Thermal Viscosity System automatically heats the heavier oils before injecting into atomizing cup. Assures quick pickup with sure and economical firing of lower cost fuels.

GAS—Designed for all types of gas—high or low pressure—the Petro circular arrangement of multiple gas jets provides a thorough mixing of gas and air *ahead* of the combustion zone. A real fuel saver. Adaptable to steady or fluctuating load requirements.

COMBINATION GAS-OIL—In one compact unit. Gives alternate stand-by fuel and permits taking advantage of fuel price fluctuations. Fuels can be switched in a few moments.

PETRO
T. M. REG. U. S. PAT. OFF

Over 50 years of leadership in automatic heating and power equipment

PETRO, 3227 West 106th Street, Cleveland 11, Ohio.

In Canada, 2231 Bloor Street West, Toronto, Ontario.

Please send me literature and specification sheets on the money-saving Petro Package Unit.

Name_____

Company_____

Address_____

City_____ State_____

Circle 119 on READ-N-CIRCLE card for more data

ideas in action

. . . starts on page 32

year, a new type of paint was tried. Macrylic plastic coating, manufactured by Maintenance Coatings Co., is based on an acrylic emulsion produced by the Rohm & Haas Co. It was applied on a moist surface under the same conditions as the enamel. It has already lasted twice as long.

Unlike alkyd and other types of paint resins, the acrylic is completely polymerized during manufacture, hence acrylic film has good strength and adhesion immediately upon application. Also, acrylic films breathe. This means that moisture under the paint can pass through, instead of being trapped to form water pockets which blister the film and eventually cause peeling.

Emergency rehabilitation for motors

Scores of flood damaged motors have been trucked in daily from devastated areas in northern Connecticut to General Electric's Wire and Cable Plant. Plant has made its facilities available for reconditioning of large motors.

Motors are cleaned with steam and solvent prior to being baked out in one of plant's huge vulcanizing ovens. Ovens are normally used in manufacture of large-size cables.

Plastic protection for battery plates

Tubing and tube sealers that encase the active material and positive plates grid spines of Exide-Ironclad industrial batteries will now be made exclusively of polyethylene. Use of the plastic with Exide's slotted-tube plate design lengthens battery life and makes it possible to increase capacity. After testing in severe electric industrial truck use, batteries with polyethylene were found to have almost full-rated capacity after five or more years. Polyethylene-tube cells were able to deliver 80- to 82-percent capacity when rubber-tube cells had only 37- to 42-percent capacity, and competitive flat-plate cells had only 3- to 12-percent capacity. Finely slotted tubes keep active material in contact with the grid spines, allow it to be penetrated freely by electrolyte. Tube sealers, attached snugly to the tube bottoms, firmly seal in active material and prevent short circuits.

Five-story glass block walls

Elimination of costly nonfunctional repair and maintenance duties present in previous stations was a guiding principle when Philadelphia Electric built its new Cromby Station. Glass-block panels were chosen because they would give optimum lighting combined with high

insulation value, eliminate sash replacement, and reduce window maintenance. Glass blocks form the entire north and south walls of a huge room that houses the two generating units. Over 11,000 glass blocks, product of the Pittsburgh Corning Corporation, are set in structural-steel framework at each end of the generator room. The room itself measures 200 feet by 120 feet. Glass blocks extend upward for 61 feet of the 78-foot height. Glass blocks will reduce glare, eliminate window-washing, make sash maintenance a thing of the past, and contribute to a more steady ventilation system.

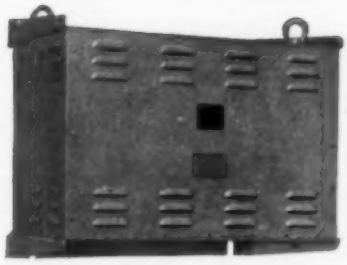
Cheaper chimney maintenance with rubber-resin paint

Only 50 gallons of white paint based on Pliolite S-5 (a synthetic rubber resin made by the Goodyear Tire & Rubber Company) were needed to cover and recondition the 190-foot chimney of Glenwood Co-Operative, Inc., producer of raw sugar from sugar cane. Its chimney carries away smoke and bagasse waste gases. Only 10 days were necessary to complete this project, although over 5000 square feet of surface had to be treated and painted. Only one coat of paint was required. Previous coatings had not been satisfactory. Exposure

TRANSFORMERS

To change higher voltage distribution service to lower voltage lighting and power circuits

¼ Kva single phase 480/240 to 240/120 volt



15 to 50 Kva 3-phase wall mounting type

100 Kva single phase

SORGEL AIR-COOLED DRY-TYPE TRANSFORMERS are the most practical type for indoor installations

Requiring no oil or liquid, they can be installed in almost any convenient place inside of buildings, without fire-proof vaults or other enclosures, and meet the requirements of the National Electrical Code. This eliminates the necessity of long runs of secondary feeders and reduces installation and wiring costs.

The transformers can be installed at load centers, using higher voltage feeders, requiring smaller copper, increasing efficiency, improving voltage regulation and reducing losses. They require no maintenance or further attention after installation.

Easy installation, easy connecting, rugged construction, low noise level.

TYPICAL APPLICATIONS

Sorgel Air-Cooled Dry-Type Transformers are used to:

- Operate 120 volt lighting and portable equipment from 240, 480 or 600 volt power circuits.
- Supply more than one voltage from a single voltage system.
- Change odd voltages to standard voltage.
- Phase changing.
- For high voltage interior distribution systems of 2400, 4160, 4800, 7200, 13,200 and up to 15,000 volts.
- For substations and load centers.

Tested and approved by Underwriters' Laboratories under the Re-examination Service

Complete line

¼ Kva to 2500 Kva single phase.
1 Kva to 3000 Kva 3-phase, 2-phase, and phase changing.

All standard voltages, such as 120, 208, 240, 480, 600, 2400, 4160, 4800, 7200, 13,200, and up to 15,000 volts, and any intermediate or special lower voltage.

Stock carried by jobbers in the following cities:

New York, N. Y.	Chicago, Ill.
Buffalo, N. Y.	Rockford, Ill.
Roxbury, Mass.	Rock Island, Ill.
High Point, N. C.	Richmond, Ind.
Raleigh, N. C.	Omaha, Neb.
Philadelphia, Pa.	Davenport, Iowa
Cincinnati, Ohio	Cedar Rapids, Iowa
Cleveland, Ohio	Beaumont, Tex.
Louisville, Ky.	Los Angeles, Calif.

Also Special Transformers and Saturable Reactors

Consult the classified section of your phone directory, or write to the factory

Sales Engineers in Principal Cities

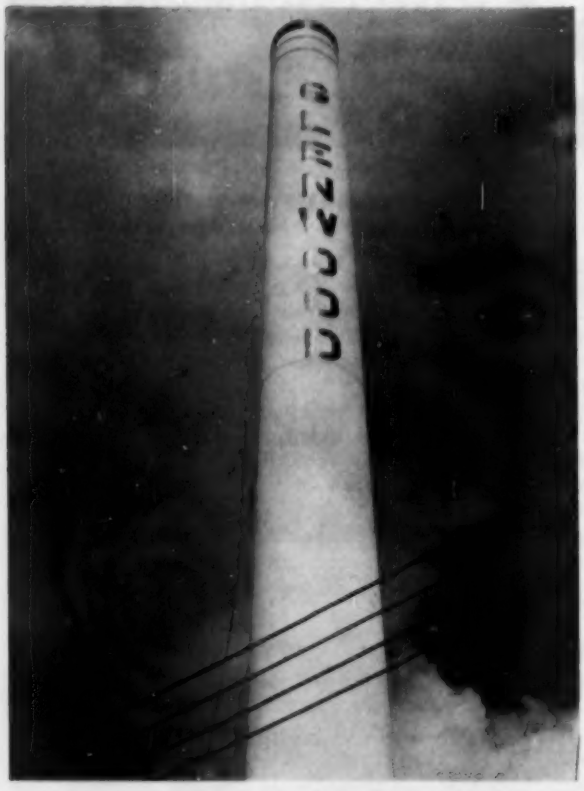
SORGEL ELECTRIC CO., 841 West National Ave., Milwaukee 4, Wis.

40 years' experience in the development, manufacturing and application of transformers

Circle 113 on READ-N-CIRCLE card for more data

ideas in action

. . . starts on page 32



to varying weather conditions and temperature extremes resulted in several fractures and an extremely porous condition on the chimney surface. Moisture infiltration had rusted out the underlying reinforcing steel.

Entire surface was hammer-tested for loose fragments, which were cut away. Underlying concrete was then scored and coated with a bonding fluid. Patching was done with a prepared waterproof and acid-resistant mortar mix.

More than 20 chimneys have been reconditioned with this rubber-resin based paint during the last three years, and they are all in good condition. The paints have excellent weatherproofing characteristics, are self cleaning, and have a breathing-type water repellency.

Ceramic-fiber filter protects recorder

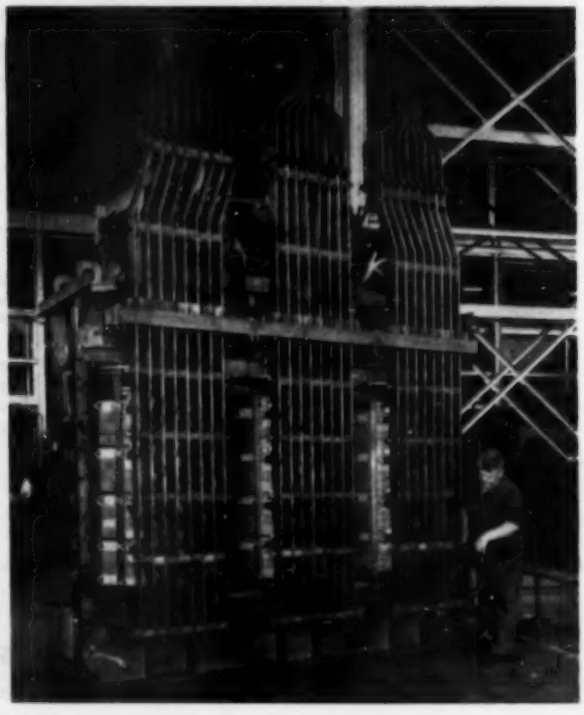
Ceramic fiber, used as a filter, has reduced instrument maintenance at least fourfold in a boiler operation at a midwestern shoe plant. The fibrous material is washable, and can be used over and over again. Fiberfrax fiber, made of aluminum-silicate by The Carborundum Company, is used as a fill-type filter in back of a recording instrument that measures CO_2 from coal-fired boiler furnaces. A random arrangement of thinner-than-hair fibers gives highly efficient filtration of foreign elements from the hot gas stream before it enters the recorder. High gas-stream temperatures and an accumulation of filtered material made steel-wool filters ineffective after only three months' service. The ceramic-fiber filter, resistant to temperatures up to 2300 F, has been in use for more than a year. It has only once been taken out for cleaning. Fiber is purified of filtered particles by baking or burning. Because of its high refractoriness, it retains its properties and filtering characteristics despite the heat of the cleaning process. The plant also uses ceramic fiber for packing expansion joints.

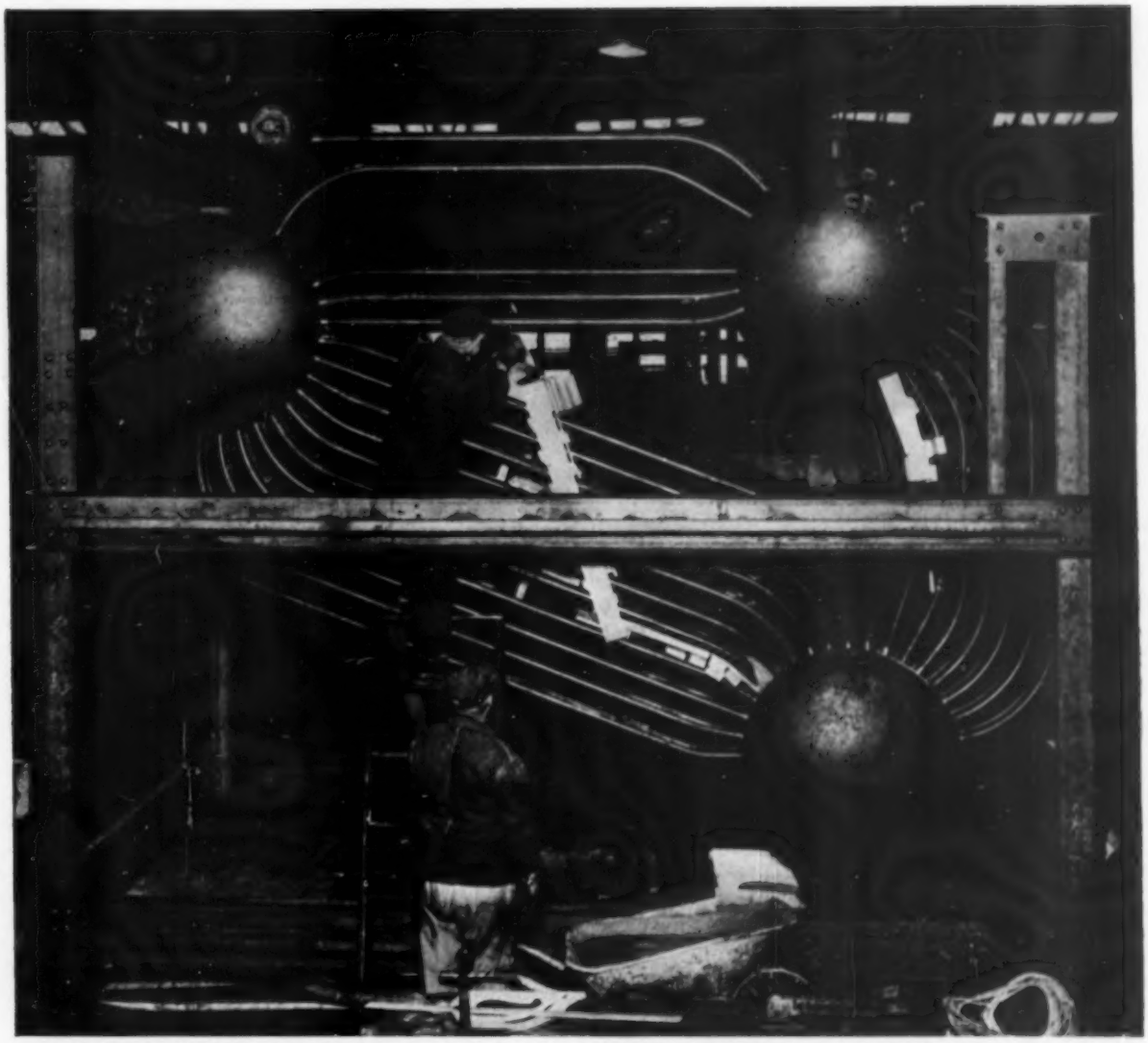
Hotter water from all-aluminum heaters

First all-aluminum hot water heater is being manufactured by Clayton and Lambert Manufacturing Company. Possibility of red, rusty water is eliminated and unit will last longer than ordinary tanks. Higher water temperatures — up to 180 F — are possible because aluminum will withstand hotter water than the materials used in ordinary tanks. No anodic protection is needed to guard against tank corrosion. New unit offers greater fuel economy. Higher flame intensity is possible since aluminum tank walls absorb heat faster and hold it longer. An external flue construction gives three times more heating surface than conventionally built heaters.

Arc-furnace transformer rated 15,000 kva

General Electric Company recently shipped an arc-furnace transformer to Atlantic Steel Co. for their second electric furnace. Transformer will convert high-voltage, low-current power to low-voltage, high-current elec-





Monolithic, gas-tight baffles of refractory concrete are easily made with a castable refractory and simple form. Packaged castables used on this job were made by Mexico Refractories Company, Mexico, Mo.

CASTABLES: Fast, Reliable, and Easy to Use

Here's a quick, easy way to handle power-plant refractory installation and repair jobs. Just add water to a prepared castable containing Lumnite* cement, mix, and you're ready to place refractory or insulating concrete. Ideal for lining steel stacks, breechings, boiler walls, doors, coal bunkers, and ash pits. Saves time and cuts costs because concretes made with Lumnite reach service strength within 24 hours.

Castables are packaged mixes of Lumnite calcium-aluminate cement plus aggregates selected for specific temperature and insulation needs. Because they are pre-mixed and ready to use, castables minimize chances for error. They are made and distributed by leading manufacturers of refractories. Keep a supply in your plant at all times. Especially handy for emergencies.

You'll find many uses for industrial concretes made with Lumnite cement throughout your plant. Write today for more information on where and how to use them.

UNIVERSAL ATLAS CEMENT COMPANY

UNITED STATES STEEL CORPORATION SUBSIDIARY

100 PARK AVENUE, NEW YORK 17, N. Y.

Albany • Birmingham • Boston • Chicago • Dayton • Kansas City
Minneapolis • New York • Philadelphia • Pittsburgh • St. Louis • Waco

*"LUMNITE" is the registered trade-mark of the calcium-aluminate cement manufactured by Universal Atlas Cement Company.

IP-L-115

Atlas® Lumnite Cement

FOR INDUSTRIAL CONCRETES

REFRACTORY • INSULATING • OVERNIGHT • CORROSION-RESISTANT

UNITED STATES STEEL HOUR—Televised on alternate Wednesdays—See your local newspaper for time and station

Circle 135 on READ-N-CIRCLE card for more data

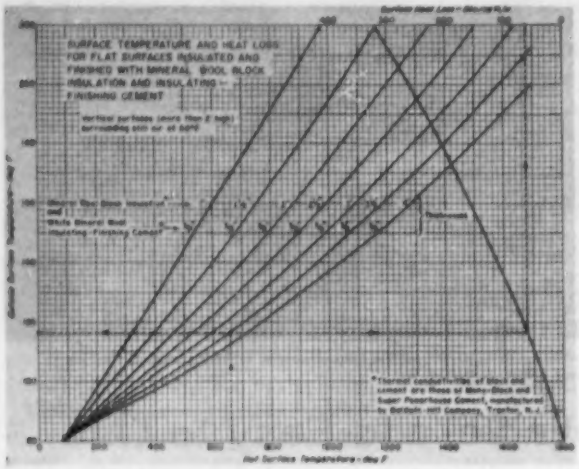
ideas in action

. . . starts on page 32

tricity for melting steel scrap in the furnace, which has 75-ton capacity. Its maximum output on the voltage side will be about 27,000 amperes. The steel firm has found electric furnaces to be more efficient than the open hearth process. Its first furnace produced 135,000 net tons of finished steel last year, using about 500 kwh per ton. The forced-oil, water-cooled transformer is rated at 15,000 kva. It has a six-position tap changer to provide varying amounts of heating current. Furnace will be equipped with GE electrode controls.

Surface temperature and heat-loss graph for block-and-cement insulation

This heat-loss graph has just been developed by the Baldwin-Hill Company to eliminate laborious repetitive calculations in determining outside surface temperature (F) and surface heat loss (Btu/sq ft/hr) for various thicknesses of mineral-wool block insulation and a


SURFACE TEMPERATURE AND HEAT LOSS FOR FLAT SURFACES INSULATED AND FINISHED WITH MINERAL WOOL BLOCK INSULATION AND INSULATING-FINISHING CEMENT

standard ⅜-inch thickness of white-mineral-wool insulating-finishing cement. Standard thicknesses of block insulation from one to four inches are given. The graph covers hot-surface temperatures up to 1700 F (the recommended limit for the block material) and outside surface temperatures as high as 220 F (well above the value that would normally be tolerated).

One engine in place of two

When a steam locomotive electromagnet crane was converted to diesel power by The Midland Iron and Steel Co., the small gasoline-engine-driven generator was eliminated. Previously, any workable arrangement for electromagnet cranes has required a separate generator to produce a constant source of dc current. Constant voltage and full output must be maintained at all times

regardless of load. One engine was impracticable because as engine speed varied so did voltage and output. Fuel and maintenance costs of the gasoline generator set were greater than those of the main engine. A Caterpillar D318 diesel engine with a twin-disc torque converter was installed. This engine powers both crane machinery and variable-speed generator. It delivers 100 hp at 1600 rpm. Generator is belt driven from a front power takeoff with a 1:1 ratio. It is double ended and has a through shaft. A rear-mounted pulley drives a 40 cu ft Westinghouse air compressor to supply air for air-actuated controls and brakes. Variable-speed generator is a 230-volt, 42-ampere, dc generator. Voltage is regulated to ± 5 percent of rated voltage within a speed range of 650 to 1750 rpm. Full-load generator output is no longer dependent upon engine speed, and it is anticipated that loading capacity can be increased by 30 percent. Converted crane also serves as switcher (it can move four or five gondola cars loaded with scrap, weighing 80 tons each), which speeds loading and unloading operations.

Metal melts five times faster

New automatic submerged-arc welding process that will deposit metal up to five times as fast as comparable welding methods and at half the power cost is in the final stages of development at Babcock & Wilcox Company. Known as the I²RT method, the new process is applicable to submerged-arc welding, in which the bare electrode is fed through a layer of granular flux, and to inert-gas shielded welding. Standard submerged-arc welding practices have been based on the principle that deposit rate is directly proportional to electrode diameter. This theory holds true with flux-coated electrodes, where current density is limited. However, B&W found that desired weld patterns could be made at deposit rates that were inversely proportional to wire size for a given current. The new process preheats the electrode almost to its melting point before it enters the arc. Thus, the arc does not have to supply sensible heat required to bring the metal to melting point, as in standard submerged-arc processes. Practically all the energy absorbed by the electrode at the arc supplies heat of fusion to melt the metal.

How to Select an Economical Temperature Regulator

First of all, what does economy mean where temperature regulators are concerned? In some industries it means improvement of product or reduction of spoilage through closer control of process temperatures. In others, it means the paring down of operating expense. The price of the regulator itself is a relatively small factor.

Today's buyers are shopping for:

1. Accuracy of control — not only when the regulator is new, but throughout its service life
2. Dependability — to prevent loss of production time
3. Minimum installation and maintenance cost

Here are a few tips on what to look for when you're installing a new or replacing an old temperature regulator —

Packless construction . . . and for this reason: A diaphragm operated, packless regulator minimizes friction. There are no closely fitted parts to stick or bind because of uneven expansion or collection of foreign matter. Also, there's less maintenance, since no repacking is ever required.

A guarantee against wire drawing of the seats and discs. Insist on it. This guarantee in combination with single seat design assures you of tight shutoff; you avoid expensive steam losses as well as loss of product in a process application.

Broad control range. In a standard regulator you should expect a control range of 100 F. And make sure the unit you select has a vapor tension thermostat that can take over-temperatures of at least 100 F.

Easy maintenance. Why ask for grief? Your temperature regulator should be basically simple in design so that it can be serviced by average plant personnel. All parts should be readily accessible for testing and cleaning.

Double duty. There's no point in buying a separate pressure regulator when you can select a temperature regulator that combines both temperature and pressure control within the same unit.

Self-operating. Make sure you get a regulator that operates on its own initial pressure. By doing so, you avoid the purchasing and maintenance of an air compressor plus air piping, and you're sure of uninterrupted operation during electric power failures.

• • • •

All of these points are important to you when it comes to selecting an economical temperature regulator. Perhaps you didn't realize you *could* expect so much. And perhaps you didn't realize that Spence Temperature Regulators offer all these features and more. May we send you our Bulletin T 500 containing further details? SE 190

SPENCE ENGINEERING COMPANY, INC.
Walden, New York

Circle 140 on READ-N-CIRCLE card for more data

spot news

. . . about industry & power

• Looking in the crystal ball

Business next year will be even better than this year, with greater output, higher wages, and higher prices in prospect, according to the forecast of 201 leading economists polled by F. W. Dodge Corporation in its annual survey of economists' opinion. However, the panel expects a slight downturn in output in the second part of next year. . . Dr. Leland I. Doan, president of the Dow Chemical Company, when speaking about the future of the magnesium industry, said that the overall situation has never added up to as great a cause for confidence as it does today. . . . The aluminum industry can be expected to expand at least another 50 percent over the next five years, according to Dexter M. Keezer, vice president and director, Department of Economics, McGraw-Hill Publishing Company. . . . A panel of leading business spokesmen forecasts that Americans in 1975 will work six fewer hours each week and be paid 25 percent more for their labors. . . . Weekend drivers will find the open road crowded with 80 million passenger cars in contrast to today's 50 million. . . . The nation's population will hit an alltime peak of 213 million. . . . California will replace New York as the most populous state. . . . Employment will increase from 1955's 65 million to a record 85 million. . . . Solar-powered transistor radios will be in widespread use, and will last a lifetime. . . . Most homes will be fully air conditioned and dehumidified by central systems. . . . The paper and paperboard industry will undergo many changes within the next 20 years. If the growth of recent years is maintained, we may expect the industry to produce about 50 million tons of paper and board in 1975 as compared with nearly 27 million tons in 1954.

• Some companies build new plants

Sylvania Electric Products has begun operations in its new 160,000-sq ft incandescent lamp plant. Atomic energy was used to start assembly machines in operation. . . . Marion Electrical Instrument Company recently started up its new $500,000 structure for production of indicating instruments, mechanisms, and related products for industrial instrumentation. . . . American Thermostat Corporation's new plant near South Cairo, New York is now in full operation, making appliance thermostats. . . . General Electric's new 600,000-sq ft control plant at Roanoke, Virginia is almost completed and pilot operations will start this fall.

• Some companies build additions

Chrysler Corporation's Airtemp Division will soon start an expansion program costing over $2 million at its Dayton, Ohio plant for the manufacture of automobile air-conditioner compressors, a new line of domestic furnaces, and waterless air conditioners. . . . Joseph T. Ryerson & Son, Inc. are building a 50,000-sq ft addition to their Buffalo, New York plant for sheet steel processing operations and extra warehouse space. . . . Trane Company is building two new additions totaling 90,800 square feet to its La Crosse, Wisconsin plant and another 30,000 square feet to its Scranton, Pennsylvania plant to provide increased manufacturing space for centrifugal refrigeration compressors, packaged water-chilling units, unit air conditioners, and year-around room air conditioners. . . . Bacon Felt Company has just opened a 10,000-sq ft addition to its Taunton, Massachusetts plant for increased production of felt wheels, bobs, and sheet felt. . . . Bryant Division of Carrier Corporation will soon start construction of an addition to its Indianapolis plant to house administration and engineering research facilities.

• Some companies plan new plants

Sylvania Electric Products, Inc. will construct a multimillion dollar plant at Altoona, Pennsylvania for production of receiving tubes. . . . Southern Nitrogen Company, Inc. will build a $14 million fertilizer plant at Savannah, Georgia. . . . Du Pont will build a full-scale plant for the manufacture of "Hypalon" chemical rubber at Beaumont, Texas. . . . Ohio Power Company will build another 225,000-kw steam-electric generating unit at its new Muskingum River plant in Ohio. . . . Goodrich-Gulf Chemicals, Inc. will build a pilot plant at Avon Lake, Ohio for production of man-made rubber, which duplicates tree rubber. . . . Hercules Powder Company will build a $10 million plant. . . . National Biscuit Company will build a new multimillion dollar biscuit and cracker bakery at Fair Lawn, New Jersey.

• Some companies expand by merging

United States Gasket Company and the Belmont Packing and Rubber Company have announced a consolidation of their product lines, sales organizations and activities under the merchandising name of U. S. Gasket-Belmont Packing. . . . The A. W. Cash Co. has purchased the business of Farris Stacon Corp., manufacturers of temperature control valves. All operations will be carried on at Decatur, Illinois. . . . Walter Kidde & Company, Inc. has acquired J. H. Scharff, Inc. and Mohawk Electrical Manufacturing Co. Scharff fabricates and sells Atmo fire detection equipment and a spot-fire detector. Mohawk manufactures a diversified line of electrical equipment for Scharff and other customers. Kidde formerly sold Atmo's fire detection equipment under license. . . . Square D Co. has formed an English subsidiary to manufacture and market its electrical distribution and control products in the British Isles and Europe. Manufacture of selected motor controls will be subcontracted to Plessey Co., Ltd., but components for assembly abroad will be exported by Square D's Milwaukee factory as an immediate stopgap.

• Dirt makes big business

U. S. manufacturers turned out nearly 73.5 million pounds of sweeping compounds last year for industrial and commercial building-maintenance use. An additional

549,500 gallons of compounds for treating dust mops, other than those used for floor sweeping, was also produced. Production of liquid wax emulsions, resin finishes, liquid floor cleaners and wax strippers, floor sealer, and solvent-type liquid waxes was 17.7 million gallons, with nearly 2.5 million pounds of paste waxes and 363,800 pounds of paste wax emulsions thrown in for good measure. These figures do not include retail-type packages for domestic consumption. Gains over 1953 production range from 4 to 56.8 percent — which proves industry's interest in good housekeeping.

• United Nations joins in

United Nations will join commercial, governmental, and educational exhibitors from the U. S. and Western Europe with an exhibit of its own in the Atomic Exposition in Cleveland, December 10 to 16. This will be the largest showing of nuclear and related materials and equipment for use in peacetime applications of atomic energy ever shown in the U. S. An actual experimental reactor (noncritical) will be in operation at the Atomic Exposition.

• More coal consumed, more electricity produced

Coal and natural gas consumption by electric utility plants during August reached alltime monthly records. The total usage of 12,588,719 tons of coal represents an increase of 4.7 percent over the previous record made in January 1955, and was 27.9 percent above August 1954 totals. Natural gas used in August amounted to 132,553,743,000 cubic feet, or 1.6 percent over the previous record for August 1954. Combined utility and industrial electricity production was 55,916,756,000 kwh, that is 18.5 percent above the figure for the same month last year. For the year ending August 31, it was 12.1 percent above the figure for the same period last year. Utility and industrial generating capacity totaled 126,060,264 kw on August 31, 1955.

• Safety record repeated

Raytheon Manufacturing Company's receiving and cathode-ray-tube operations have achieved a record of working nearly two million man-hours without a lost-time injury. This equals the record set by these operations in 1934. Quincy cathode-ray-tube plant has just completed one of the finest safety runs in the industry, operating almost a year (298 days) without a lost-time injury. Credit for advice and assistance is given to the Massachusetts Safety Council and to Liberty Mutual Insurance Company.

• Research on steam

ASME's research committee on properties of steam is still soliciting contributions for research on this subject. Main purpose of the proposed research project is to provide data for extension of present steam tables to 1500 F and 15,000 psi. It would supplement the research that led to establishment of the International Skeleton Steam Table of 1934, which stopped at 1032 F and 5000 psi. These limits have been exceeded in actual practice. Present need is for accurate information to confirm data achieved by extrapolation of the 1934 figures.

Use of higher operating temperatures and pressures is

Roll tubes the WILSON Way

Rolling tubes in high pressure boilers, superheaters, economizers, marine steam generators and other heat exchange equipment is simple *and* safe with Wilson Tube Expanders.

Wilson Tube Expanders offer smooth, efficient rolling action, which insures firm seating of the tube, provides perfectly rolled joints, reduces time-wasting re-rolling and re-inspection. For example, Wilson Model 38 Tube Expander, shown here, is a popular tool which rolls and flares in a single operation. It is available for tubes from 1" OD to 4½" OD with various roll lengths for tube sheets ½" and up in thickness.

FREE Wilson Catalogs

Write for new Wilson Tube Cleaner Catalog 77 and comprehensive Tube Expander Catalog. ➔

Representatives in all principal cities

THOMAS C. WILSON, INC.

21-11 44th AVENUE, LONG ISLAND CITY 1, N. Y.

CABLE ADDRESS: "TUBECLEAN" NEW YORK

WILSON TW846

TUBE CLEANERS • TUBE EXPANDERS

Circle 124 on READ-N-CIRCLE card for more data

spot news

. . . starts on page 74

given a major share of credit for the downward trend in consumers' average cost per kwh of electricity. Pressure and temperature conditions at which steam is now used make imperative a significant amount of research in thermometry to determine the relationship between the international temperature scale and the true thermodynamic scale, including the experimental evaluation on the thermodynamic scale of the fixed points of the international scale.

Revision and extension of this whole field of knowledge is long overdue with regard to both thermodynamic properties and also to the so-called transport properties having significance in problems of friction and heat transfer. These include thermal conductivity and viscosity of water substance over a wide range of pressures and temperatures.

There is also reason for study concerning the relaxation rate of the water molecule at high pressures and temperatures. This is of interest wherever steam at high temperature is subjected to rapid expansion, as in turbines. It measures the amount by which the steam may deviate from equilibrium conditions as represented in the steam table. This is analogous to the supersaturation effect in wet steam. Plans have been completed for the letting of five contracts: two in problems of viscosity, to be conducted by Dr. J. Kestin, associate professor of engineering, Brown University, Providence, R. I., and Dr. T. W. Jackson, Georgia Institute of Technology; one on the Joule-Thompson coefficient and specific heats, to be conducted by Dr. B. H. Sage, professor in the Department of Mechanical Engineering, California Institute of Technology; one on relaxation rate of steam, to be conducted by Dr. R. B. Lindsay, of Brown University; and one on thermal diffusivity, to be conducted by Dr. W. B. Harrison, Georgia Institute of Technology.

• Corps of Engineers concerned

Industrial expansion in flood zones may reach such a degree eventually as to call for additional flood control measures to protect encroaching enterprises, according to Emil P. Schuleen, chief of the Engineering Division, Pittsburgh District, Corps of Engineers.

"Economic considerations may limit the degree of flood protection that may be provided and thus leave some areas subject to residual flood damages," he said. "Unless this limitation is fully understood by all concerned, progressive expansion in the flood zone eventually may reach such proportions that additional flood control measures will be required to protect the added wealth placed in the path of the flood waters. Flood plain zoning offers a means of controlling development within the flood zone to the degree that can be tolerated without increasing the frequency of excessive flood damages."

• Solar energy symposium

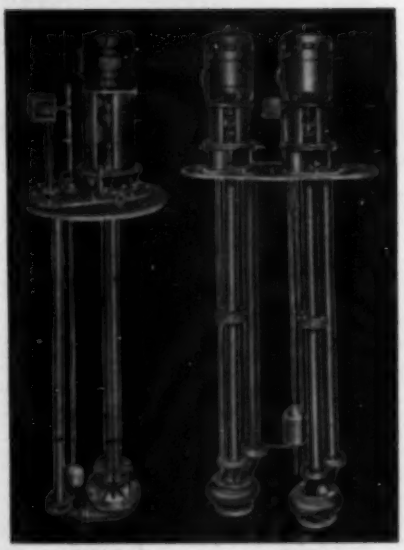
While most of the country was buying up supplies of antifreeze, the Symposium on Applied Solar Energy and the Conference on Solar Energy got underway in Arizona

GET NON-CLOG PUMP PERFORMANCE
at "ordinary" pump prices—with the
AMERICAN-MARSH NKS vertical wet pit pump

Now — at no more than the cost of ordinary pumps — you can get full *non-clog* performance with the American-Marsh NKS! On vertical wet pit applications, the NKS delivers remarkably high efficiency, handling clear liquids or liquids with solids up to three inches in diameter.

You'll also find it extremely versatile in application. You can get both single and duplex models with wetted parts furnished in standard iron, bronze or special alloys. Numerous items of optional equipment further increase adaptability to special requirements.

The NKS Pump is moderately priced . . . and like *every* American-Marsh Pump, receives a complete operating test before shipment. So when you specify sewage and sump pumps, be sure you get the *extra performance* American-Marsh Pumps deliver . . . *at no extra cost!*



SINGLE DUPLEX

For complete specifications —
WRITE FOR
BULLETIN 325-A.
Models from 25 to 800 GPM at heads from 10 to 60 feet.

"Pumps — and Pumps Only — Since 1873"

AMERICAN-MARSH PUMPS
BATTLE CREEK MICHIGAN
In Canada:
American-Marsh Pumps (Canada) Ltd., Stratford, Ont.

Circle 128 on READ-N-CIRCLE card for more data

early last month. The Solar Engineering Exhibit on the lawns of Phoenix Civic Center showed working models of a 2½-hp sun-driven engine, a solar water heater, solar ovens, and water stills. A five-foot solar furnace (loaned by Convair, a division of General Dynamic Corporation) was built from a converted 60-inch surplus searchlight mirror to show that temperatures as high as 3000 C can be obtained by concentrating sunlight with a parabolic reflector on a suitable target. An estimated 40,000 persons attended the exhibit.

• Service training course

Combustion Control Division, Electronics Corporation of America, is conducting a weekly Fireye service training course in Boston, Massachusetts. The five-day course provides an opportunity for fuel-burning-industry servicemen and engineers to become familiar with controls and control systems used with present-day burner installations. Course covers control system wiring, modulating systems, automatic damper controls, and accessory equipment as well as electronic combustion safeguards. There is no charge for the course, and the company pays expenses.

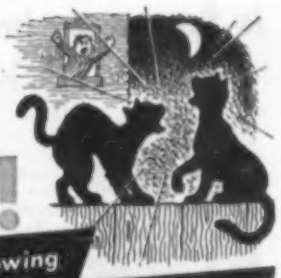
• Research in the news

U. S. Department of Commerce held an exhibit in the Department of Commerce Building, Washington, D.C. last month, with "Research and Progress in the Mechanical Field Under the U. S. Patent System" as its theme. About 17 well-known manufacturers contributed displays. . . . Engineering Foundation, which administers the income from a $1.5 million fund dedicated to the stimulation of engineering research, has made available its allocations for the coming year. Grants total $61,850 and will advance 26 projects, which are receiving estimated outside support of $426,000. . . . General Electric Company has opened a new analytical chemistry laboratory to broaden its studies of material substances that make up the world and everything in it. It is a part of the engineering laboratory's $1.4 million expansion program. . . . Jones & Laughlin Steel Corporation has dedicated its new $1.5 million research laboratory in Pittsburgh. . . . Using toy-scale models of buildings, smokestacks, coal piles, and electric transmission towers, New York University research engineers recently begun an air pollution study of a Niagara Mohawk Power Corporation plant near Buffalo. To determine height and design of a single tall smokestack that will supplant two existing short stacks, engineers are examining the downwash behavior of stack gases from the new plant. They will also suggest speeds at which gases should be ejected and advise on the use of nozzles on the stacks.

• Sales figures in the news

Sales, total earnings, and earnings per share of common stock for the third quarter of 1955 were the highest for any quarter in the history of Johns-Manville. . . . General Electric Company sales for the first nine months of 1955 totaled almost $2¼ billion, an increase of 4 percent for sales for the same period in 1954. . . . Stewart-Warner Corporation's consolidated net sales for the nine months ended September 30 were 19 percent higher than those for the same period in 1954. . . . Allis-Chalmers Manufacturing Company reported its sales for the first nine months of 1955 were $396 million — an alltime

STOP THAT NOISE!



we don't advise throwing BURGESS-MANNING SNUBBERS

— at the cats, but we can assure you they will throw your annoying, costly and unnecessary intake and exhaust noises for a loss. Burgess-Manning Snubbers are designed to silence noise from air, steam and other gases being discharged into the atmosphere, or air intake of engines, compressors, blowers, etc. These noises can be very costly to you in disrupted and incorrect oral communications, jittery personnel, poor neighbor relations, and even in compensation claims for impaired hearing. Burgess-Manning Snubbers are engineered to your needs.

Tell us your problem — let us recommend

BMM Sound Engineering

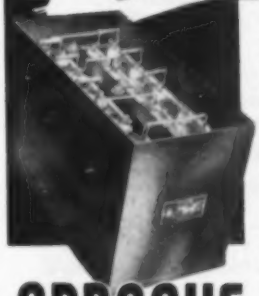
BURGESS-MANNING COMPANY

767 East Park Avenue, Libertyville, Illinois
Dallas, Texas

Circle 137 on READ-N-CIRCLE card for more data

HOW TO SAVE ON POWER BILLS

...also on wiring, switchgear and transformer costs!



Cut costs by installing Sprague power factor correction capacitors on your motors and other inductive electrical equipment! Monthly power bills can frequently be materially reduced. Greater loads can be handled from existing circuits. Wiring, transformer and switchgear costs can be greatly minimized in new installations.

SPRAGUE "ON-THE-SPOT" *Power Factor Correction* CAPACITORS

WRITE FOR GUIDE

We've put the whole power factor correction story in an easily understood 28-page guide 508, replete with cost saving suggestions and factual installation data. Write for your copy today.

SPRAGUE ELECTRIC COMPANY
351 Marshall St. North Adams, Mass.

Circle 114 on READ-N-CIRCLE card for more data

Is Space an Important Factor?

Then Use This Distinguished Line of Close-Coupled Pumps

These GMC Pumps are ideal for a multitude of jobs. Smooth and efficient whether vertical, horizontal, up-side-down or any inclination. Low first cost, low power and maintenance costs. Top quality "by Aurora."
Caps. 10 to 800 G.P.M.
Heads to 250 Ft.
AURORA Always PUMPS
Type GMC Aurora Close-Coupled Pump
Write TODAY for CONDENSED CATALOG "M"
DISTRIBUTORS IN PRINCIPAL CITIES
also BULLETIN 120

AURORA® PUMP DIVISION
THE NEW YORK AIR BRAKE COMPANY
42 LOUCKS STREET • AURORA • ILLINOIS

Circle 129 on READ-N-CIRCLE card for more data

coming events

. . . for industry & power

Dec. 12-17	AIChE Nuclear Congress & Atomic Exposition	Municipal Auditorium Cleveland
Jan. 23-26	Plant Maintenance & Engineering Show	Convention Hall Philadelphia
Jan. 30-Feb. 3	AIEE Winter General Meeting	Hotel Statler New York
Mar. 18-21	ASME Spring Meeting	Multnomah Hotel Portland
Mar. 21-23	American Power Conference	Hotel Sherman Chicago
Mar. 26-27	ASME Instruments and Regulators Conference	Princeton Univ. Princeton, N. J.
Apr. 1-5	ASME Oil, Gas, and Power Conference	Jung Hotel New Orleans
Apr. 2-4	AIEE South West District Meeting	Dallas
Apr. 5-7	8th Biennial Electric Industry Show	Shrine Hall Los Angeles
Apr. 16-17	ASME Gas Turbine Power Division Conference	Hotel Statler Washington, D. C.
Apr. 16-18	AIEE Great Lakes District Meeting	Fort Wayne Indiana
May 2-4	AIEE North Eastern District Meeting	Rochester, N.Y.
June 17-21	ASME Semiannual Meeting	Statler Hotel Cleveland

spot news

. . . starts on page 74

high for the company. . . . Third-quarter sales and earnings of Westinghouse Electric Corporation were adversely affected by a prolonged production loss of heavy apparatus which resulted from work stoppages called by the International Union of Electrical Workers (CIO). Sales were almost $378.5 million, compared with over $401.5 million in the third quarter of 1954.

• Big orders in the news

Westinghouse Electric Corporation has been awarded a $2.5 million contract for a 113,000-kw turbogenerator for Pennsylvania Power Company. Unit is scheduled for delivery in August 1957, and will be installed as the fourth unit in PPC's New Castle power plant. . . . Orders for multistage DRV turbines, boiler feed-pump-drive turbines, and a hot-flow gas turbine costing about $900,000 have been received by the General Electric Company's small-turbine and supercharger department. GE also has orders for four more boiler-feed-pump drive turbines for large generating stations.

• Old soldiers never die

Virginia Electric & Power Co. has retired a pioneer 3250-kw Allis-Chalmers steam turbogenerator. The unit, nicknamed "General Lee", was the highest-rated 1800-rpm machine in the U.S. in 1908. It has delivered as high as 5500 kw for several hours in the course of its 47 years' service. Maintenance costs during this time were all listed on one half of a repair index card.

• Another national week

The week of February 6, 1956 has been selected as National Electrical Week by representatives of the electrical industry. This is Thomas A. Edison's birthday week. The week will be celebrated annually. Its purpose will be to focus attention on the contributions of electricity to our way of life and on the contributions toward economic strength of the country made by the organizations which make up the electrical industry.

• More power for Florida

Florida Power Company is constructing a new generating unit at its Suwanee River plant that will double the station's present capacity and add 70,000 kw net capability to the system. Powered by a 600,000 lb/hr boiler, the turbogenerator will operate on 1450 psi steam at 1000 F.

• World survey of dust recovery advancements

R. F. O'Mara, formerly vice president and sales manager of a leading organization in the dust and suspension-recovery field, recently left on a four-month, around-the-world junket to personally study the latest advancements in dust and air pollution controls now being used in the industrial areas of 17 major countries. After more

than 18 years' first-hand experience in the field, O'Mara has become established as a consulting engineer in industrial fume control. He feels that there is much to be learned from foreign methods of attacking this problem.

• Coal stock piles are down

As of August 31, bituminous stock piles in the country were estimated to contain nearly 71 million tons of coal. With September production totalling some 41 million tons, and indicated use and export estimated at about the same tonnage, only negligible changes in coal inventories are expected when the official figures for the month are printed. However, this 71 million tons of bituminous coal inventory represents (in total days' supply) a smaller inventory relative to use than has existed at the end of summer since 1950. Holdings in that year were low because of long strikes and labor disturbances of the 1949-50 period. The current low ratio between stocks and usage has occurred as a result of a fairly rapid rise in U. S. coal consumption without an accompanying strengthening of inventory position. From the levels of 1953, both coal usage and coal stocks dropped in approximate proportion during the industrial decline of 1954. However, while U. S. consumption is showing a rise of 12 percent or more from 1954, coal stocks are averaging little if any higher than last year. It is to be expected that certain coal-customer industry groups — particularly those showing growth in coal consumption — find themselves in an even shorter inventory position. The electric utilities, for instance, slipped to 99 days' supply as of August 31, representing a decline of a full month from a year ago.

• New pipe-joint welding process

The American Welding Society recently accorded prominence to the technical paper of W. A. Pollock, technical engineer of power plants, Wisconsin Electric Power Company, which tells in detail of pioneering in Oak Creek high-pressure, high-temperature pipe welds. Its title, "Backing-ring Elimination Permits Ultrasonic Testing and Avoids Cracking of Piping Welds," has proved extremely meaningful to piping and power specialists. The new process has improved the safety and reliability of power plant highly-stressed and almost-cherry-red steam piping markedly. These vital gains have been achieved at lesser cost and with reduced erection time. Avoidance of internal cracking and ability to "see" reliably any minute flaws in the several-inches-thick piping are the two principal merits of the new method.

• More mechanization required

Don G. Mitchell, chairman and president of Sylvania Electric Products Inc., has told a congressional subcommittee that the increasing use of mechanization or automation, which already has met unprecedented public demands for goods and services, will have to be stepped up even more rapidly in the future if a serious labor shortage is to be averted. In the electronics industry, he stated, mechanization already has prevented a labor shortage. He added that it was only through the use of automatic and semiautomatic equipment that the electronics industry, as we know it today, exists at all. He predicted that the subcommittee's hearings on the impact of automation on economy will do much to erase false fears. He said, "They will point out that any technological trend or any area of economic progress is of no real significance except in the sense that it influences the individual. No machine, no electronic brain ever has or ever will make anything. Only people make things."

Westmoreland Coal Company

HAMPTON COAL · CRITERION COAL

Stonega Coke and Coal Company

GLENBROOK · RODA · CROSSBROOK · STONEGA · DENDRON

Page Coal and Coke Company
Crozer Coal and Land Company

LYNCO · CROZER

PREMIUM ANTHRACITES
Products of Jeddo-Highland Coal Company
Hazle Brook—Raven Run

Genco Anthracites & Bituminous Coals

General Coal Company
123 SOUTH BROAD STREET . . . . . PHILADELPHIA 9, PA.
SUBSIDIARY SALES COMPANY—EASTERN COAL & COKE COMPANY
Cable Address: GENCO

Branches

BLUEFIELD, W. VA. · BUFFALO · CHARLOTTE, N. C.
CINCINNATI · CLEVELAND · IRWIN, PA.
NEW YORK · NORFOLK

Circle 139 on READ-N-CIRCLE card for more data

free bulletins

. . . just circle key numbers on READ-N-CIRCLE CARD on page 83

Air cleaning equipment

501-Dust collection manual

"The Collection and Recovery of Industrial Dusts," 32-page Manual 101, discusses various types of dust and techniques used in analysis, lists the factors which influence choice of equipment, and explains operation. BUELL ENGINEERING CO., INC.

502-Series on dust and fume collectors

Exhaust fans for dust collecting and air handling are described in Catalog 1002-6. Includes complete performance tables and test curves. Plans and elevations of typical installations are shown. Separate additional bulletins contain descriptions, dimensions, capacities of Norblo bag type, hydraulic type, and centrifugal dust collectors. THE NORTHERN BLOWER CO.

Air conditioning, heating, ventilating

503-Air condition your powerhouse

New line of central-station, cabinet-type air conditioning units are described in Bulletin 8127. Ten-page section shows tables and graphs that enable engineers to determine the exact type of unit required for their installation. Variety of unit arrangements to meet wide range of specifications and characteristics are illustrated with drawings. Twenty pages. AMERICAN BLOWER CORPORATION.

504-Industrial fan selection guide

Engineers and designers interested in quick, accurate selection of industrial fans for required capacities will find 27-page Bulletin EX-531 a useful, timesaving tool. The catalog introduces the type EX industrial fan, a medium speed, air and material handling unit. BAYLEY BLOWER CO.

Boilers and boiler accessories

505-Boiler setting and baffle data

More than 30 boiler-setting plans are shown, with an analysis of how each arrangement of tubes is baffled to meet the specific boiler design, in 20-page Bulletin BW-54. THE ENGINEER CO.

507-Boiler instrument handbook

Boiler instruments to cover every phase of operation from water treatment to dust removal are contained in Bulletin GSP-901. Illustrations and text are combined to make this bulletin a necessity for engineers interested in boiler and steam problems. Twenty-six pages. HAGAN CORPORATION.

508-Do your own boiler survey

Here's how to get a boiler survey form without obligation. Write for this bulletin covering the new CB self-contained boiler. Illustrations of installations, cutaway views of the boiler, and articles on how the units have proved themselves in specific applications are included. Four pages. CLEAVER-BROOKS CO.

510-Package boiler tables

Bulletin PSG-2 contains tables of capacities, dimensions, and weights of nine typical package boilers. Includes illustrations of firing and control equipment plus recommendations for field installation for the three pressure-classes available. Ten pages. HENRY VOGT MACHINE CO.

511-How to survey your steam needs

Formulas behind all package steam generators and illustrations of how a package steam generator installation can raise steam capacity without extensive structural changes are presented in Booklet "Sales Steam-2-1." An example shows how to make a professional survey of your own steam requirements. Complete records and two installation case histories are included. Twelve pages. CYCLOTHERM DIVISION, NATIONAL-U.S. RADIATOR CORPORATION.

512-Steam cost calculator

Made of heavy board, this Steam Cost Calculator will enable you to read directly cost of steam per horsepower for installations using oil, coal, or gas. It also gives a direct reading of efficiency of the system. HAPMAN DUTTON CO.

514-Water tube boiler features

Water tube package boilers, known as the Compak line, are described in seven-page Booklet 5000. Design and construction features are shown in cutaway drawings with a list of standard equipment, optional equipment, and a graph of performance curves. INTERNATIONAL BOILER WORKS CO.

Building construction materials

515-How to preserve masonry

Kinds of masonry, effects of water absorption from without and vapor migration from within, and methods of caulking and pointing prior to application of preservatives are thoroughly explored in "Masonry Preservation." Well illustrated with diagrams and photographs, the book is divided into 10 sections. It is based on information obtained from both laboratory and field experience. Sixteen pages. THE TREMCO MANUFACTURING COMPANY.

516-Reference book on Foamglas

Physical properties of Foamglas cellular-glass insulation, and suggested thicknesses for temperatures between –50 and 800 F are offered in Bulletin 37-D-1, 2. Condensed recommended specifications and application photographs make this a worthwhile reference book for engineers. Eight pages. PITTSBURGH CORNING CORPORATION.

518-How to build better masonry

Recommended practice covering materials, proportioning, mixing, and laying of units is offered in Bulletin WP6.55-35M. Three essentials to better masonry and four essentials to better mortar are given with quantity reference tables. Twenty-four pages. UNIVERSAL ATLAS CEMENT COMPANY.

SUBJECT INDEX

Air cleaning equipment 80
Air conditioning, heating, ventilating 80
Boilers and boiler accessories 80
Building construction, materials 80
Compressed air supply 81
Corrosion control 81
Drafting methods, equipment 81
Electrical distribution 86
Electrical utilization 87
Engines: diesel, gas, steam 87
Fire protection 87
Fuels and firing equipment 87
Heat exchangers 88
Instruments and controls 88
Lighting 88
Lubrication 88
Maintenance items 89
Materials handling (bulk) 89
Mechanical power transmission 90
Piping, tubing, and hose 90
Pumping equipment 91
Refractories and insulation 91
Traps, strainers, and separators 91
Turbines 92
Valves and regulators 92
Vibration and noise control 92
Waste disposal 92
Water supply and treatment 93

520-Special manual for grating

All information and data vital to the plant engineer are given in this manual that covers all types of grating, open steel floor armor, stair treads, vessel liners, bridge decking, and drain grates. It includes safe-load tables, panel width constant charts, tables on standard widths and types of steel stair treads, and types of grating anchors. Booklet makes a handy reference tool. Sixteen pages. KLEMP METAL GRATING CORPORATION.

Compressed air supply

521-Are you wasting air?

"A Better Air Power System," Folder 213A points out that power losses in compressed air lines are frequently as high as 30 to 50 percent. It describes just how to go about finding out if more air is being wasted than the repair and renovation of the distribution system would cost. Six pages. INGERSOLL-RAND CO.

522-Compressors for heavy duty

Bulletin L-675-B1B describes belt-driven and direct-connected motor-driven compressors in detail. These horizontal duplex-type compressors operate at moderate speeds for heavy-duty continuous service. Exclusive Feather Valves are discussed. 36 pages. WORTHINGTON CORP.

523-Compressors in cross section

Horizontal heavy duty air and gas compressors, Type T, are described in 15-page Bulletin 728-8. Cross section of crankshaft, inlet valve unloading system, compressor cylinder and valves, and the complete compressor add to the value of the booklet. CHICAGO PNEUMATIC TOOL CO.

Corrosion control

524-Handy protective coating chart

Tables of properties, application techniques, and industrial uses are offered in Catalog 2-55-3M. Twelve pages. AMERCOAT CORPORATION.

525-Rubber linings stop corrosion

Application of rubber lining to prevent corrosion of tanks, pipes, and valves is discussed and pictured in four-page folder. In addition, two-page reprint tells how rubber lining can stop circulating pipe corrosion. LA FAVORITE RUBBER MFG. CO.

Drafting methods, equipment

526-Simplify your drafting practices

Sample drawings of engineered parts and assemblies illustrate the eleven rules (from the use of word descriptions for simple parts to making freehand drawings wherever possible) for simplifying drafting practices. These simplified methods have shown that it is possible to cut the total number of hours required to

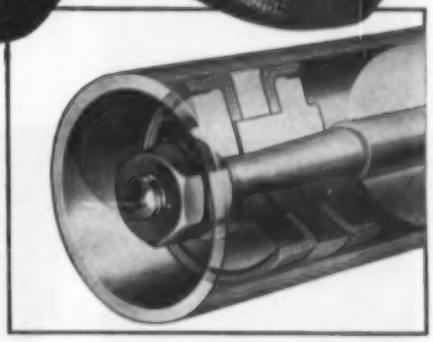
(more free bulletins on page 86)

PUMCUP ADVANTAGES

now yours for

- *HYDRAULIC CONTROLS*
- *AIR CYLINDERS*
- *RECIPROCATING PUMPS*

Two common Pumcup types: conventional and 45° bevel type . . . available in a complete range of sizes and texture-engineered compositions.



Cutaway view of typical Pumcup installation resulting in prolonged high efficiency.

TAKE it from experienced users, Darcova Pumcups offer payoff advantages that can't be equalled! For example, they last many times as long as ordinary piston packing . . and they *hold peak efficiency* from start to finish. Because of the resulting production and maintenance economies, plant after plant is standardizing on Pumcups.

Improved application of the cup principle does the trick. And Darcova Pumcups are *texture-engineered* in *a range of compositions* to meet most temperature-pressure-fluid conditions. And they are available in sizes and types exactly right for your particular equipment.

It will pay you to get *all* the facts. Just ask for Pumcup Bulletin No. 5503.

DARLING VALVE & MANUFACTURING CO.
Williamsport 9, Pa.

DARCOVA
THE ORIGINAL COMPOSITION CUP
TRADE MARK
PUMCUPS

Circle 130 on READ-N-CIRCLE card for more data

The following list is typical of the process industries served by

SUPERIOR STEAM GENERATORS

ALCOHOL
ARTIFICIAL LEATHER
CEMENT
CERAMICS
CHEMICALS
COAL TAR PRODUCTS
ELECTRODES
FOOD PRODUCTS
GLASS
LINOLEUM
PAINT AND VARNISH
PETROLEUM
PROVISIONS
PULP and PAPER
RUBBER
SOAP
SUGAR REFINING
VEGETABLE and MINERAL OILS
WATER GAS
WOOD CHEMICALS

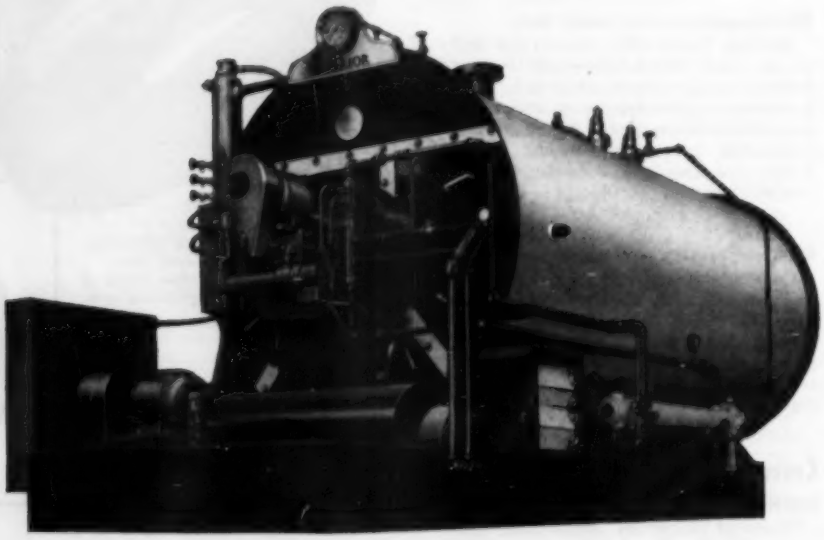
18 sizes from 20 to 600 b.h.p. and for pressures to 250 p.s.i. For complete details write today for Catalog 702

STEAM

at the POINT OF USE

cuts costs for process industries

To provide high quality process steam for widely separated operations, many processing plants are installing completely packaged Superior Steam Generators at, or close to the point where steam is used. These highly efficient and compact units may be set up on any floor capable of supporting their weight, connected to service supply and fuel lines, and put into operation within 24 hours of delivery.



Put a *PACKAGED PLANT* in your picture

Avoid the trouble and expense of inefficient long steam lines by installing completely packaged Superior Steam Generators at the point of steam consumption. Superior Steam Generators are fully automatic, burning oil, gas, or both in combination; and are guaranteed to operate at thermal efficiencies in excess of 80%.

for performance you can **BANK** *on*

SUPERIOR COMBUSTION INDUSTRIES INC.
TIMES TOWER, TIMES SQUARE, NEW YORK 36, N.Y.

SUPERIOR STEAM GENERATORS

Circle 106 on READ-N-CIRCLE card for more data

Use a READ-N-CIRCLE card for FREE new product information, handbooks, bulletins, literature for your data file.

READ

this issue of Industry & Power

and

CIRCLE

the key numbers on the adjoining cards corresponding to the advertisements, new products, and literature items that interest you.

Drop the READ-N-CIRCLE card in the mail. No stamp is needed.

INDUSTRY & POWER'S Reader Service Department will immediately forward your requests to the manufacturers, who will send directly to you the information you request.

handy guide

. . . to advertised products

Air cleaning equipment

Guaranteed efficiency

Read page 95 and circle number 101

BUELL ENGINEERING COMPANY. Years of experience enable Buell to guarantee efficiency with every "LR" Fly Ash Collector. Write for free booklet.

Compact air cleaning

Read page 30 and circle number 100

CLAUDE B. SCHNEIBLE CO. Multi-Wash dust collectors can be installed inside, outside, or on the roof of your plant. Save valuable floor space.

Effective dust collection

Read page 91 and circle number 149

NORTHERN BLOWER COMPANY. Norblo engineered dust collection systems are outstanding in all industries for high recovery, and low operating costs. Consult Norblo.

READ-N-CIRCLE Card for FREE information

Your name _____ Title _____

Company name _____

Company address _____

City _____ Zone _____ State _____

Please give company name above. If you wish delivery of free information at home, also fill in below.

Home address _____

City _____ Zone _____ State _____

100	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124
125	126	127	128	129	130	131	132	133	134	135	136	137	138	139	140	141	142	143	144	145	146	147	148	149
150	151	152	153	154	155	156	157	158	159	160	161	162	163	164	165	166	167	168	169	170	171	172	173	174
400	401	402	403	404	405	406	407	408	409	410	411	412	413	414	415	416	417	418	419	420	421	422	423	424
425	426	427	428	429	430	431	432	433	434	435	436	437	438	439	440	441	442	443	444	445	446	447	448	449
450	451	452	453	454	455	456	457	458	459	460	461	462	463	464	465	466	467	468	469	470	471	472	473	474
475	476	477	478	479	480	481	482	483	484	485	486	487	488	489	490	491	492	493	494	495	496	497	498	499
500	501	502	503	504	505	506	507	508	509	510	511	512	513	514	515	516	517	518	519	520	521	522	523	524
525	526	527	528	529	530	531	532	533	534	535	536	537	538	539	540	541	542	543	544	545	546	547	548	549
550	551	552	553	554	555	556	557	558	559	560	561	562	563	564	565	566	567	568	569	570	571	572	573	574
575	576	577	578	579	580	581	582	583	584	585	586	587	588	589	590	591	592	593	594	595	596	597	598	599
600	601	602	603	604	605	606	607	608	609	610	611	612	613	614	615	616	617	618	619	620	621	622	623	624
625	626	627	628	629	630	631	632	633	634	635	636	637	638	639	640	641	642	643	644	645	646	647	648	649
700	701	702	703	704	705	706	707	708	709	710	711	712	713	714	715	716	717	718	719	720	721	722	723	724
725	726	727	728	729	730	731	732	733	734	735	736	737	738	739	740	741	742	743	744	745	746	747	748	749

INDUSTRY & POWER December, 1955 Card void after April 1, 1956

READ-N-CIRCLE Card for FREE information

Your name _____ Title _____

Company name _____

Company address _____

City _____ Zone _____ State _____

Please give company name above. If you wish delivery of free information at home, also fill in below.

Home address _____

City _____ Zone _____ State _____

100	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124
125	126	127	128	129	130	131	132	133	134	135	136	137	138	139	140	141	142	143	144	145	146	147	148	149
150	151	152	153	154	155	156	157	158	159	160	161	162	163	164	165	166	167	168	169	170	171	172	173	174
400	401	402	403	404	405	406	407	408	409	410	411	412	413	414	415	416	417	418	419	420	421	422	423	424
425	426	427	428	429	430	431	432	433	434	435	436	437	438	439	440	441	442	443	444	445	446	447	448	449
450	451	452	453	454	455	456	457	458	459	460	461	462	463	464	465	466	467	468	469	470	471	472	473	474
475	476	477	478	479	480	481	482	483	484	485	486	487	488	489	490	491	492	493	494	495	496	497	498	499
500	501	502	503	504	505	506	507	508	509	510	511	512	513	514	515	516	517	518	519	520	521	522	523	524
525	526	527	528	529	530	531	532	533	534	535	536	537	538	539	540	541	542	543	544	545	546	547	548	549
550	551	552	553	554	555	556	557	558	559	560	561	562	563	564	565	566	567	568	569	570	571	572	573	574
575	576	577	578	579	580	581	582	583	584	585	586	587	588	589	590	591	592	593	594	595	596	597	598	599
600	601	602	603	604	605	606	607	608	609	610	611	612	613	614	615	616	617	618	619	620	621	622	623	624
625	626	627	628	629	630	631	632	633	634	635	636	637	638	639	640	641	642	643	644	645	646	647	648	649
700	701	702	703	704	705	706	707	708	709	710	711	712	713	714	715	716	717	718	719	720	721	722	723	724
725	726	727	728	729	730	731	732	733	734	735	736	737	738	739	740	741	742	743	744	745	746	747	748	749

INDUSTRY & POWER December, 1955 Card void after April 1, 1956

Boilers and boiler accessories

More performance—less cost

Read page 22-23 and circle number 103

BABCOCK & WILCOX. B & W boilers show substantial savings as a result of greater efficiency, less coal and ash handling, elimination of fly-ash problems, more complete fuel combustion, and lower fuel costs. Check with B & W on planning your next boilers.

Cost-cutting baffles

Read page 88 and circle number 104

THE ENGINEER CO. Save fuel and reduce maintenance with Enco boiler baffles. Designed by specialists.

Titusville handles the load

Read page 21 and circle number 107

THE TITUSVILLE IRON WORKS COMPANY. TICOTHERM steam generators offer flexibility and efficiency. Can be adapted for all processing and heating needs.

Low cost steam producer

Read page 93 and circle number 102

CONTINENTAL BOILER ENGINEERING AND SUPPLY COMPANY, INC. Generate steam and produce hot water at low cost and little maintenance. Efficiencies over 80-percent are guaranteed—fully automatic. Send for fact-filled catalog.

Gauge your liquids

Read page 100 and circle number 105

THE LIQUIDOMETER CORP. For gauging liquids of all kinds. One-hundred percent automatic. Underwriters' Laboratory approved. Write for complete details.

Steam at the point of use

Read page 82 and circle number 106

SUPERIOR COMBUSTION INDUSTRIES INC. Completely packaged Superior Steam Generators can be installed at the point of steam consumption. Can be installed and operating within 24 hours. Catalog 702 gives sizes and ranges.

Union exceeds 80 percent efficiency

Read page 29 and circle number 108

UNION IRON WORKS. Union type MH package steam generators offer proven performance in efficiency and economy. Bulletin MH-353 gives complete story with cutaway illustrations, tube layouts, and dimension tables.

Communications systems

Losing man-hours?

Read page 2 and circle number 109

AUTOMATIC ELECTRIC SALES CORPORATION. Cut losses with instant communication. Install a P-A-X Business Telephone System in your plant. Write for an actual "on-the-job" case study.

Compressed air supply

Lower compressed air cost

Read page 92 and circle number 110

NIAGARA BLOWER COMPANY. Cooler, dryer air is obtained with the Niagara Aero aftercooler. Direct saving in the cost of cooling water saves the price in less than two years. Write for Bulletin 130.

Electrical distribution

Eliminate motor burnouts

Read page 89 and circle number 111

HEINEMANN ELECTRIC CO. No need for winter and summer ratings with Heinemann Motor Controllers, unaffected by heat or cold. No stoppages—no changeovers. Send for Manual 101 and Bulletin 1410.

Circuit breaker testing

Read page 3 and circle number 112

I-T-E CIRCUIT BREAKER COMPANY, SWITCHGEAR DIVISION. Exclusive I-T-E low-voltage switchgear feature—test your circuit breakers with compartment doors closed. Write for Bulletin 6004B describing the modern compact design of I-T-E equipment.

FIRST CLASS
PERMIT No. 19
(Sec. 34.9, P.L.&R.)
ST. JOSEPH, MICH.

BUSINESS REPLY CARD
NO POSTAGE STAMP NECESSARY IF MAILED IN THE UNITED STATES

4¢ POSTAGE WILL BE PAID BY

INDUSTRY & POWER

COMMERCIAL BANK BLDG.

ST. JOSEPH, MICH.

FIRST CLASS
PERMIT No. 19
(Sec. 34.9, P.L.&R.)
ST. JOSEPH, MICH.

BUSINESS REPLY CARD
NO POSTAGE STAMP NECESSARY IF MAILED IN THE UNITED STATES

4¢ POSTAGE WILL BE PAID BY

INDUSTRY & POWER

COMMERCIAL BANK BLDG.

ST. JOSEPH, MICH.

handy guide

. . . starts on page 83

Transformers for your power
Read page 69 and circle number 113
SORGEL ELECTRIC CO. Air-cooled dry-type transformers are the most practical type for indoor installation. Easily installed. Write for information.

Save on power bills
Read page 77 and circle number 114
SPRAGUE ELECTRIC COMPANY. Cut costs—install power factor correction capacitors on your electrical equipment. Send for 28-page Catalog 50B.

Electric generation

Economy in power generation
Read pages 14-15 and circle number 140
ALLIS-CHALMERS. Today, industry turns to A-C for modern steam turbine generation. The popular WA series is available in 2000 to 16,500 kw ratings. Bulletin 03B-7654 describes advantages.

Fuels and firing equipment

Fuels do make a difference
Read page 13 and circle number 115
CHESAPEAKE AND OHIO RAILWAY. There's a lot more to buying coal than considering the cost per ton. Want to solve your particular fuel requirements? C&O will be glad to help.

Analyze your coal
Read page 6 and circle number 116
THE ENOS COAL MINING COMPANY. Superior preparation and quality of Enos and Enoco coals give you efficient heat and lower steam cost.

Coal for every use
Read page 79 and circle number 139
GENERAL COAL COMPANY. A variety of anthracites and bituminous coals are offered. Branches in leading cities.

Oil preheating
Read page 8 and circle number 118
NATIONAL AIROIL BURNER CO., INC. Fuel oil pumping and heating units will give you premium performance from your burners by delivering fuel oil at proper temperature and pressure. Bulletin 40 gives interesting and informative data on this company's years of experience.

Boiler room savings
Read page 67 and circle number 119
PETRO. Complete package unit for oil, gas, or combination oil-gas firing. Pretested, simply bolt on and fire.

Instruments and controls

Gage glasses
Read page 26 and circle number 120
ERNST WATER COLUMN & GAGE CO. High-pressure glasses and gasket available in all sizes from stock. Catalog available.

Lubrication

Pressure system lubrication
Read page 94 and circle number 121
NEW YORK & NEW JERSEY LUBRICANT COMPANY. Prolong the life of your equipment with Non-Fluid Oil. Send for free sample and bulletin.

Automatic lubrication
Read page 19 and circle number 122
MANZEL, DIVISION OF HOUDAILLE-HERSHEY CORP. Force-feed lubricators insure efficient equipment operation. Lubricate automatically. Write for details.

Maintenance items

Instant concrete patch
Read page 100 and circle number 123
FLEXROCK COMPANY. Repair broken factory floors without tieup. This tough concrete patch sets instantly! Mail coupon for free booklet.

Safe tube expanders
Read page 75 and circle number 124
THOMAS C. WILSON, INC. Smooth, efficient rolling action makes tube expanding simple and safe with Wilson. New Catalog 77 available with comprehensive data on tube cleaning and expanding.

Materials handling (bulk)

Simple efficient coal storage
Read page 99 and circle number 125
KALAMAZOO TANK AND SILO COMPANY. Keep your coal dry in industrial storage silos. No freezing or deterioration. No maintenance needed. Bulletin 1153-B gives details.

Mechanical power transmission

Nonslip collars
Read page 97 and circle number 126
STANDARD PRESSED STEEL COMPANY, HALLOWELL POWER TRANSMISSION DIVISION. Solid steel collars that stay put. Held in place on the shaft by Unbrako set screws. Bulletin 868 describes complete stock and uses.

Piping, tubing, and hose

Leakproof unions
Read page 33 and circle number 127
DART UNION COMPANY. Vacuum-tested to assure precision tightness. Drop-tight and easy to install.

Pumping equipment

Nonclog pumps
Read page 76 and circle number 128
AMERICAN-MARSH PUMPS. High efficiency at low cost with NKS vertical wet pit pump. Nonclog performance at ordinary pump price. Bulletin 325-A.

A tradition of integrity
Read page 78 and circle number 129
AURORA PUMP DIVISION, THE NEW YORK AIR BRAKE COMPANY. Aurora's integrity stands behind its pump recommendations. Catalog "M" describes full line.

Piston packing performance
Read page 81 and circle number 130
DARLING VALVE & MANUFACTURING CO. Now—pumcup offers advantages for hydraulic controls, air cylinders, reciprocating pumps. Unequalled performance with peak efficiency. Get the facts in Bulletin 5503.

Long lasting—low maintenance
Read page 17 and circle number 133
DE LAVAL STEAM TURBINE COMPANY. De Laval Oppeller pumps stay on the line longer and cost less to maintain. Used for boiler feed, hydraulic systems, refinery oil pumping and many other services.

Economical water pumping
Read page 25 and circle number 134
WORTHINGTON CORPORATION, VERTICAL TURBINE PUMP DIVISION. More and more industrial plants are turning to Worthington vertical turbine pumps as the most economical means of supplying water.

Impulse steam trapping
Read page 34 and circle number 136
YARNALL-WARING COMPANY. Get equipment hot in a hurry, and keep it hot with unique Yarway Impulse Steam Trap.

Nuclear pump leadership
Read page 9 and circle number 131
BYRON JACKSON. Every company in the United States using nuclear reactors has consulted Byron Jackson for pump equipment. Write for special paper on pumps for nuclear power.

New boiler feed pump
Read page 102 and circle number 132
BYRON JACKSON. Medium size power plants now can get trouble free boiler feed pump service. No need to remove piping with horizontally split case.

Refractories and insulation

Fast, reliable castables
Read page 71 and circle number 135
UNIVERSAL ATLAS CEMENT COMPANY. (U. S. STEEL). Just add water to your castable containing Lumnite cement and it is ready to use as refractory or insulating concrete. Save time and cut costs. Write for information on uses of Lumnite.

handy guide

. . . starts on page 83

Vibration and noise control

Stop that noise
Read page 77 and circle number 137
BURGESS-MANNING COMPANY. Snubbers are engineered to correct your specific noise problems from air, steam, and other gas discharges. Let our sound engineers recommend solution. No obligation.

Valves and regulators

Proven dependability
Read page 7 and circle number 138
EVERLASTING VALVE CO. Half a century of service assures dependable, leak-tight valves. Let Everlast solve your valve problems.

Versatile gate valve
Read page 65 and circle number 117
THE CHAPMAN VALVE MANUFACTURING COMPANY. Low cost operation—top valve performance. Chapman List 960 forged steel gate valve has a wide variety of applications. Catalog 10 gives full details.

No reducing valve needed
Read page 73 and circle number 140
SPENCE ENGINEERING COMPANY, INC. For real economy in temperature control, Spence offers a temperature regulator that eliminates need of a reducing valve. For details of design features and engineering, write for Bulletin T500.

Water supply and treatment

Effective water conditioning
Read page 11 and circle number 141
W. H. & L. D. BETZ. Completely integrated engineering on all water problems is offered by Betz. From research to installation the Betz water specialists are at work for you.

Trouble-free water for steam
Read page 27 and circle number 143
DEARBORN CHEMICAL COMPANY. If your steam lines are clogged and inside diameter of piping is reduced by scale, Dearborn offers the correct treatment to eliminate the trouble. Mail the coupon for complete information.

Simplified water control
Read page 101 and circle number 142
COCHRANE CORPORATION. Easy, accurate control of ion exchange equipment available. Consult Cochrane first.

Improved demineralization
Read page 21 and circle number 144
INFILCO, INC. Infilco engineers saved one company 14 cents per thousand gallons of treated water. Infilco can save money for you too. Write for information.

Trouble-free decorator
Read page 87 and circle number 145
L'A WATER SOFTENER COMPANY. Stainless steel internals, and no moving parts eliminates corrosion of vital parts. Prevents clogging or sticking and reduces maintenance problems. Bulletin 102 gives details.

Packaged water treatment
Read page 90 and circle number 146
ILLINOIS WATER TREATMENT CO. Completely self contained and pre-assembled mixed bed deionizer can be installed in your water supply line. Write for details.

Demineralizers built
Read page 97 and circle number 147
HUNGERFORD & TERRY, INC. A complete line of water conditioning systems is available from H&T. All sizes, all capacities, manual or automatic. Send for bulletin.

free bulletins

. . . starts on page 80

complete a given volume of work by 40 to 50 percent. Thirty-six pages. AMERICAN MACHINE AND FOUNDRY COMPANY.

Electrical distribution

528-Dry transformers for high temp
Designed for higher temperatures to keep weights and dimensions as low as possible, these new totally-enclosed dry-type transformers with NEMA group three, class H insulation for indoor, outdoor applications are described in Bulletin 61B8222. A discussion of the advantages with high-temperature insulation is included with questions and answers on dry-type transformers. Four pages. ALLIS-CHALMERS MANUFACTURING COMPANY.

530-How to choose circuit breakers
All essential information on the selection and application of molded case and large air circuit breakers is presented in this Speedfax catalog. Application sections make extensive use of charts and tables to explain selection of circuit breakers for motor circuits, bus duct, conductors, and transformer secondary applications. Also included are the latest prices, dimensions, and ordering instructions—arranged and indexed to reduce reference time and errors. Sixty pages. I-T-E CIRCUIT BREAKER COMPANY.

532-Transformer connection diagrams
Diagrams and explanations of transformer power and lighting connections are offered in Bulletin CS-102. Common single-phase applications are covered. Also included are typical connections demonstrating the importance of open delta or wye hook-ups during emergencies when it is necessary to maintain service in spite of transformer failure. Eight pages. KUHLMAN ELECTRIC COMPANY.

533-Correct that low power factor
Booklet 50B, 27 pages, describes the Unit-Cell Box Type Capacitors which offer easy-to-install, economical means of correcting low power factor for large or small power consumers. SPRAGUE ELECTRIC CO.

534-Lowdown on dry transformers
The applications, sizes, types, and construction of air-cooled dry-type transformers is described in Bulletin 155. Specifications are included. Special custom-built transformers and reactors are discussed. Eight pages. SORGEL ELECTRIC COMPANY.

536-How to select connectors
"How to Select and Use Today's Electrical Connectors," nine-page Technical News Letter 24, contains two articles on design of electrical connectors and their efficient application in modernizing industrial plants' electrical distribution systems. BURNDY ENGINEERING CO., INC.

FREE COPIES

For free copies of these handbooks, bulletins, and catalogs just circle the key numbers on the READ-N-CIRCLE card on page 83.

537-Outdoor service equipment guide
Designed to make easier the selection of outdoor service equipment, 12-page Bulletin 2016 combines descriptive data on all available standard equipment—service entrance, receptacle type, dual control, three-phase units. HEINEMANN ELECTRIC CO.

Electrical utilization

538-Control devices guide

Photos, diagrams, and specifications for key switches, impulsing devices, switchboard lamps, and other control devices are given in 28-page Bulletin 4018-D. AUTOMATIC ELECTRIC CO.

539-Complete motor buying data

Complete buying information on standard ac fractional and integral horsepower motors is presented in Bulletin GEC-1026. A special section on selection of integral horsepower motors covers lead requirements, enclosures, starting current limitations, speeds, motor types, and selection of fuses and circuit breakers. Information includes descriptions, and standard modifications. Twenty-eight pages. GENERAL ELECTRIC COMPANY.

541-More compact type H motors

Manufacturing developments and improved electrical characteristics make the new Type H motor more compact than previous models. Multicolor Bulletin 1856 shows cutaway views of the new Uniclosed motor. The new Type H conforms with new NEMA specifications. Twelve pages. U. S. ELECTRICAL MOTORS, INC.

542-Immersion heater data charts

Electric immersion heating elements for industrial, commercial, and domestic use are described in Bulletin EC-53. Contains data charts, descriptive material, and total wattage requirements for heating of solids, liquids, or gases. List of custom-made heaters is included for special problems. Twenty-six pages. CUTLER-HAMMER, INC.

Engines: diesel, gas, steam

543-Heavy-duty diesel engines

Information on the lubrication, cooling, and fuel injection systems of Type S and SS heavy duty diesel engines is presented in Bulletin 10,040. It includes details about engine housing design, full floating aluminum bearings, large diameter crankshaft, gear-driven auxiliaries, specifications, and engineering data. Illustrations of the engine and component parts are included. INGERSOLL-RAND.

544-Diesel rating chart

DR Diesel Engines, as used in municipal power plants, water works, sewage treatment plants, and other industrial applications, are shown in eight-page Bulletin S-500-B52B. Rating chart gives information on 5, 6, 7, and 8 cylinder engines from 550 to 2200 hp. WORTHINGTON CORP.

Fire protection

545-Useful facts on fire fighting

Engineering data and useful facts on Foamite Airfoam fire protection systems, portable and semi-portable equipment, are well illustrated in Bulletin AD 17004-10M. Information to help combat various types of flammable liquid fires is included. Thirty-six pages. AMERICAN LA-FRANCE CORPORATION.

Fuels and firing equipment

546-Controls for gas firing

How automatic combustion control systems are used with many gas-fired boilers is presented in Bulletin MSA-116. Fourteen pages. HAGAN CORP.

547-Preassembled oil, gas burners

Advantages of preassembled oil, gas, and combination oil and gas burners are listed in eight-page Bulletin P-152. Units in sizes from 50 to 900 hp are listed for four common gas pressures and all grades of oil. COEN CO.

548-Industrial heating handbook

New handbook provides plant engineers with basic concepts of industrial heat processing and heat control. Pruned of technical language, the handbook goes from a discussion of heat-to-fuel cost

ALL STAINLESS INTERNALS eliminates corrosion of vital parts . . . specially designed to keep undeaerated water from contact with tank.

NO MOVING PARTS completely self-adjusting at all loads without springs or mechanical gadgets . . . no clogging or sticking . . . no maintenance problems.

Send for FREE Bulletin 102

L·A

L ★ A WATER SOFTENER COMPANY

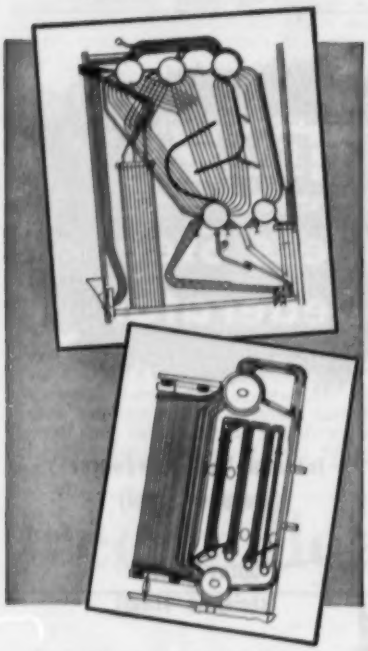
1007 Air Way Glendale 1, California

Circle 145 on READ-N-CIRCLE card for more data

ONLY ENCO BAFFLES

give you all these

COST CUTTING FEATURES



These important fuel-saving maintenance-reducing features are obtainable with Enco boiler baffles—*and only with Enco baffles.*

- **Streamlined gas flow**
- **Uniform gas flow**
- **Elimination of bottlenecks**
- **Reduced draft losses**
- **Higher heat transfer**
- **Cleaner heating surfaces**
- **Less use of soot blower**
- **Special provision for expansion**
- **Easy tube replacement**
- **Adaptable to any water-tube boiler, fired by any fuel**

Each application is designed on the basis of more than a quarter century of experience in this specialized branch of power engineering. Installations are made by skilled mechanics.

THE ENGINEER CO.

75 WEST STREET, NEW YORK 6, N.Y.

In Canada: Rock Utilities Ltd., 80 Jean Talon St. W., Montreal, P. Q. ec-eco

Circle 104 on READ-N-CIRCLE card

free bulletins

. . . starts on page 80

comparisons to design elements. Common formulas used in calculating heat and oven requirements are included. Bulletin 555 is a refresher course in process heating, and is a must for all plant engineers. Twenty pages. MICHIGAN OVEN COMPANY.

Heat exchangers

549-Heat exchanger operation

Air-flow diagram in two-page Data Sheet 124 graphically shows operation of the Aero Heat Exchanger for water, oil, or compressed air cooling. How the unit saves cooling water, piping, pumping, and equipment costs is explained. NIAGARA BLOWER CO.

550-Heat exchange equipment specs

This 16-page bulletin gives all pertinent specification data for hot water storage heaters, instantaneous and converter heat exchangers, instantaneous and converter water heaters, and fuel oil heaters. PATTERSON-KELLEY CO., INC.

551-Finned tubing shrinks exchangers

These finned tubes permit the use of heat exchangers that are smaller in size, weight, and space than units with bare tubes. Bulletin 1300 tabulates more than a dozen ferrous and non-ferrous material combinations and the many sizes of fins and tubes that are available. Also mentioned is the interrupted type of fin tube for use with viscous fluids. Four pages. THE GRISCOM-RUSSELL CO.

Instruments and controls

554-Positive mercury switch controls

Positive controls for pressure, vacuum, temperature, liquid level, and other variables, equipped exclusively with sealed mercury switches are described in Bulletin 26/Me. Four pages. THE MERCOID CORP.

555-Boiler instrumentation data

Modern power plant instruments and control systems are described with the aid of photographs and schematic drawings in Bulletin 55-605-83. Combustion instruments and panels are treated in detail. Twenty-four pages. THE HAYS CORPORATION.

556-Electronic speed control manual

Illustrations and circuit diagrams describe in nontechnical simplified language the installation, performance, and maintenance of the basic Dynamatic electronic control. Also describes principles used to accomplish stepless speed control using an ac line as the power source. Sixteen pages. EATON MANUFACTURING COMPANY.

557-How to select temp control

Temperature ranges and other properties of liquid expansion, gas-pressure, and vapor-pressure filled systems are tabulated to aid in selection of control systems for any application in Catalog 12-A-10. Line of instruments for indicating, recording, controlling, transmitting, compensating, and programming temperatures from −400 to +1000 F are also described. Twenty-four pages. FISCHER & PORTER CO.

558-All-purpose water flow meters

Principles of operation of nutating-piston-type meters are explained in Bulletin 36. It contains illustrations and data of typical installations, trap strainers, air release valves, high-pressure meters, and meter registers for the measurement of most fluids. Twenty pages. BUFFALO METER CO.

559-Hot-water boiler safety controls

Safety valves, low-water fuel cutoffs, and feeder cutoff combinations are described with engineering data in Bulletin P-30. Common questions about hot-water boiler safety are answered with the aid of colored diagrams. Eight pages. MCDONNELL & MILLER, INC.

Lighting

560-Fluorescent lamp handbook

"Fluorescent Lamps and Auxiliary Equipments," eight-page Technical Bulletin LS-101, gives complete data on the Circline, general line, Slimline, and rapid start lamps. Wiring diagrams, equipment for each type of lamp, and equipment for suppression of radio interference are included. Application Engineering Dept., Lamp Div., GENERAL ELECTRIC CO.

Lubrication

561-Portable oil maintenance units

New portable line of oil filters makes possible on-the-spot maintenance of lubricating and industrial oils. Bulletin 316 also includes information, illustrations, and references about combination oil filters and reclaimer units. These units are ideal for filtration and vacuum vaporization of water and other volatile contaminants in turbine, diesel, transformer, transmission and hydraulic oils. Four pages. THE HILLIARD CORPORATION.

562-Do's and don'ts for bearings

A helpful list of "do's" and "don'ts" to prolong bearing life appears in Bulletin 506. Also included is information on the storage and handling of lubricants. Four pages. NEW YORK AND NEW JERSEY LUBRICANT CO.

Maintenance items

564-Metallurgy library is free

Helpful publications for all engineers interested in metallurgy are included in Lists A and B. All are free, and list includes an invitation to submit specific problems. Twenty and eight pages. THE INTERNATIONAL NICKEL COMPANY.

FREE COPIES

For free copies of these handbooks, bulletins, and catalogs just circle the key numbers on the READ-N-CIRCLE card on page 83.

565-Stainless steel data book

This new data book is a must for every engineer's library. Design and dimensional information on flange drilling templates, flange and ring-joint facings, stainless steel pipe, pipe threads, pressure-temperature ratings and conversion factors, resistance to fluid flow, hardness conversion tables, physical, and mechanical properties of stainless steel are covered. Detailed materials selection chart for more than 300 corrosive solutions is included. Sixteen pages. COOPER ALLOY CORPORATION.

567-Pocket handbook on alloys, fluxes

Information for all engineers responsible for jointing, tinning, or cutting of steel, aluminum, and aluminum alloys, cast iron, copper, copper-bearing alloys, magnesium, nickel, monel, stainless steel, and zinc die-cast is now available in pocket-sized handbook. Data on 15 alloys not previously cataloged are included. Thirty-two pages. ALL-STATE WELDING ALLOYS CO., INC.

Materials handling (bulk)

569-Conveyor belt design chart

Engineering data for standard conveyor belt construction is shown in color on this chart for eight of the most popular ply and material combinations. It shows theoretical ultimate strength, actual ultimate strength, faster strength, operating strength with fasteners and with splice, and troughing index. A separate data sheet is included. QUAKER RUBBER CORP., DIV. OF H. K. PORTER CO., INC.

570-Wall chart for caustic safety

Handy wall chart that gives 37 specific suggestions for safe handling of solid,

REMINDER!

Have you changed your electrical system over to winter?

Let's reduce motor burnouts this year. Remember to change your motor protectors back to winter ratings.

During the hot summer months, many maintenance departments are forced to up-rate the elements in motor protectors to prevent nuisance stoppages due to high temperatures. When winter comes, they neglect to change back to normal ratings. That's when many motor burnouts occur.

ELIMINATE THE WHOLE PROBLEM

You can lick the whole problem, and eliminate motor burnouts too . . . just by using Heinemann Motor Controllers. The rating of Heinemann Motor Controllers is unaffected by heat or cold. No unnecessary stoppages in summer; no change-overs for winter.

The difference is that Heinemann Motor Controllers operate on power, not heat. Instead of thermal elements, they employ a hydraulic-magnetic principle that you should know about.

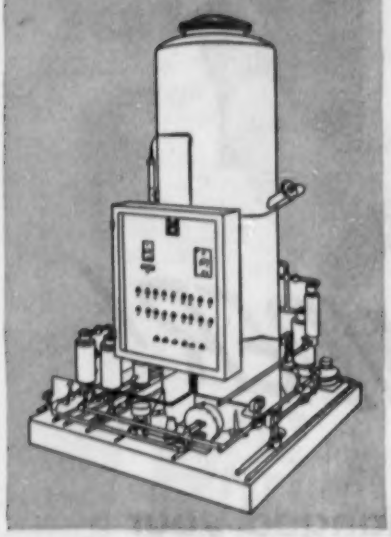
Send for a copy of Manual 101, *"What you should know about Circuit Breakers"* and Bulletin 1410 on Heinemann Motor Controllers. HEINEMANN ELECTRIC CO., 140 Plum St., Trenton 2, N. J.

HEINEMANN Motor Controllers

Circle 111 on READ-N-CIRCLE card for more data

ILLCO-WAY

ionXchange



NEW AUTOMATIC "PACKAGE" UNIT FOR LOW-MAKE-UP POWER PLANTS

Now, at reasonable cost, power plants with moderate make-up requirements can take advantage of the many benefits offered by ionXchange — by installing the compact and preassembled unit illustrated above. This is a complete Mixed-Bed De-Ionizer with all necessary indicators and automatic controls, including push-button regeneration, ready for hook-up in your water supply line. *Please write for details.*

ILLINOIS WATER TREATMENT CO.

ionXchange

ILLCO-WAY

840 CEDAR ST.
ROCKFORD,
ILLINOIS

NEW YORK OFFICE: 141 E. 44TH ST. NEW YORK 17, N. Y.
CANADIAN DIST. PUMPS & SOFTENERS, LTD. LONDON, ONT.

Circle 146 on READ-N-CIRCLE card

free bulletins

. . . starts on page 80

liquid, and flake caustic soda is based on accumulated plant experience. Printed in two colors on coated linen stock. Covers first aid measures, protective practices and equipment, dissolving and unloading procedures. There is space for emergency telephone numbers. DIAMOND ALKALI COMPANY.

571-Conveyor belt slide rule kit

Two slide rules that cut the time required for designing a conveyor belt installation from three hours to ten minutes are now available. They are part of a conveyor belt construction kit. One is a horsepower calculator. The other is a carcass selector. They incorporate the engineering data contained in a 40-page conveyor belting notebook. UNITED STATES RUBBER COMPANY.

572-How to store bulk materials

Storage bins for bulk materials such as ashes, coal, coke, sand or lime are fully discussed in this bulletin. Contains tables of cubic foot weights of flowable materials, capacities, description of wall construction, test data, and other relevant engineering data with many photographs, illustrations, and line drawings. Twenty-nine pages. The NEFF & FRY CO.

Mechanical power transmission

574-Wire-rope strength tables

Tables of wire-rope breaking strengths are included with descriptions of standard Tru-Loc fittings and assemblies in Catalog TL 500. Reference charts, tables, and drawings are included with a section on special assemblies that can be made to order. Twenty-four pages. AMERICAN CHAIN & CABLE CO., INC.

575-V-belt rating manual

"Multi-V-Drives," this 100-page master engineering manual presents a scientific and simplified method for rating V-Belts. In addition to accepted theories on V-drive engineering, factors such as small diameter sheaves, centrifugal force, average hours per day operation, and other conditions affecting belt lines have been considered. WORTHINGTON CORP.

576-Texrope-drive selection tables

Handy multicolor tables for quick and easy selection of constant speed Texrope V-belt drives is now available. Booklet 20P40 also contains information on design features, basic drive principles and data on sheaves. Seventy-four pages. ALLIS-CHALMERS MANUFACTURING COMPANY.

577-Transmission data tables

Book of useful engineering information such as procedures for calculating horsepower of spur, helical, herringbone, worm, and zerol gears are offered in Bulletin G-655. Tables of engineering data such as hardness conversion, recommended keyways, stresses in shafts, determination of moment of inertia, speed ratios of planetary gearing, and horsepower charts make this book a must for plant engineers interested in power transmission. Seventy pages. PHILADELPHIA GEAR WORKS, INC.

Piping, tubing, and hose

578-How to remove piping deposits

"A Solution to the Problem of Deposits in Piping Systems," four-pages, describes the three principal methods used in cleaning lines: chemical, pipe line pig, and jet moles. Case histories from industry are given to demonstrate where the methods should be used. DOWELL, INC.

579-How to select flexible hose

Cutaway diagrams and photographs illustrate construction and applications of flexible metal hose in Bulletin 147. Includes full engineering data and section on selection. Twelve pages. FLEXONICS CORPORATION.

580-Stainless steel piping data

Engineers and designers concerned with problems involving stainless piping will find valuable data in six-page Bulletin TB-356. It outlines methods of bending and joining stainless pipe and discusses the problems of light wall versus heavy wall pipe with tables of dimensions and weights of various stainless pipe size schedules. THE BABCOCK & WILCOX CO.

581-Friction loss chart

Friction loss chart for flexible hose is offered in Bulletin 41-44 along with application and technical data. Accessories, installation data, and price lists are included. Eighteen pages. THE FLEXAUST COMPANY.

582-Laminated Teflon pipe

Physical and chemical properties of this pipe, manufactured from woven glass impregnated with Teflon, are included with piping specifications in Bulletin FTL-1. Detailed description of flanging and coupling the pipe in the field and suggested applications for this inert plastic pipe are also included. Four pages. RESISTOFLEX CORPORATION.

Pumping equipment

583-Sewage and sump pump selection

Comprehensive, eight-page Bulletin 325-A32 is for engineers, architects, and contractors who specify sewage and sump pumps. It describes in detail three types of pumps: The NKS Vertical Wet Pit Single or Duplex; the NKV Vertical Dry Pit; and the NKH Horizontal. AMERICAN-MARSH PUMPS, INC.

584-Two-stage boiler feed pumps

Close-coupled and frame-type two-stage pumps in capacities to 300 gpm at heads from 300 to 550 feet at 250 F are described in Bulletin 52B6105C. Pumps are suitable for boiler feed, humidifier, air conditioning, high head building, and mine service. Dimension tables for both types of pumps and performance charts are included. Six pages. ALLIS-CHALMERS MANUFACTURING COMPANY.

585-Water pump selection table

Condensed selection table is a valuable guide to horsepower and head-capacity ratings of vertical pumps for industrial primary water supply. Described in Bulletin 100. Sectional illustrations with enlarged views of special features describe pumps clearly. Distribution systems are covered. Eight pages. LAYNE & BOWLER PUMP COMPANY.

Refractories and insulation

586-Refractory construction

The different types of construction considered standard for industrial refractory are described in Bulletin 39. Profusely illustrated. Twenty pages. BIGELOW-LIPTAK CORP.

587-Using sheet insulation

"Marinite For Driers, Ovens, Breechings, and Housings," 16-page booklet IN-153 A, tells you how you can build and insulate with this sheet material. Handling and working recommendations, data on physical and thermal properties, and construction and fabrication suggestions are given. JOHNS-MANVILLE.

FREE COPIES

For free copies of these handbooks, bulletins, and catalogs just circle the key numbers on the READ-N-CIRCLE card on page 93.

Traps, strainers, and separators

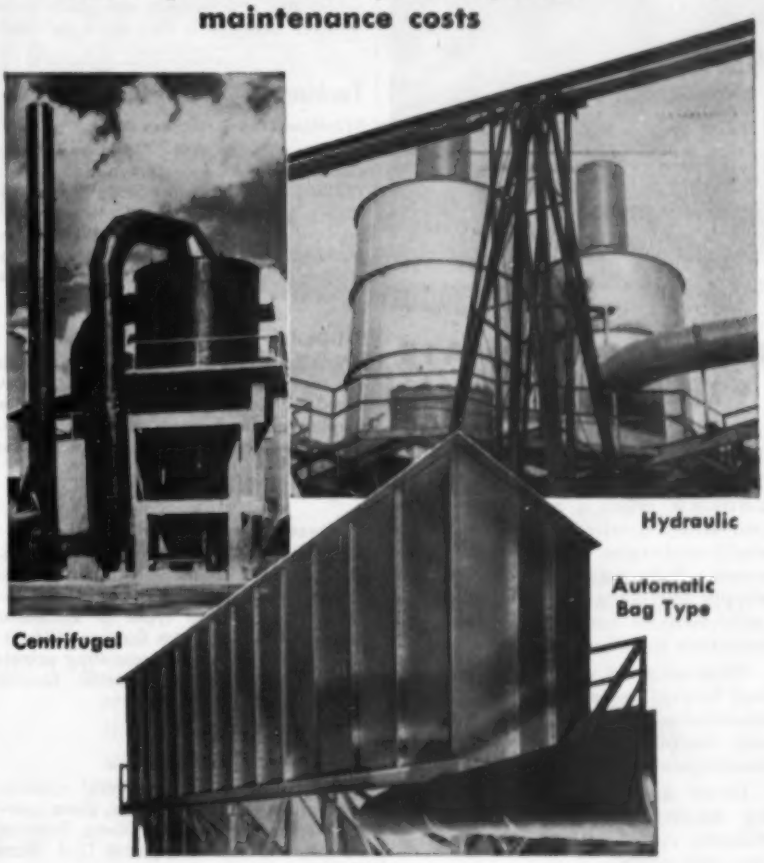
588-Traps fit all needs

Ball float traps for draining water from air, gas, or steam lines or for draining light liquids from gas under pressure are described in eight-page Bulletin 289. An orifice capacity chart and tables of maximum operating pressures help in selection. ARMSTRONG MACHINE WORKS.

Norblo

Dust and Fume Collection Systems

make outstanding records for high recovery with low operating and maintenance costs



These three important types of Norblo collecting systems, frequently used in certain combinations, bring you economical, dependable control as required in a wide range of industries. "Guaranteed Efficiency" is not an empty phrase at Norblo. We stand back of every installation that's used for the purpose and at the capacity for which we designed it. All component parts are made by Norblo, under controlled specifications.

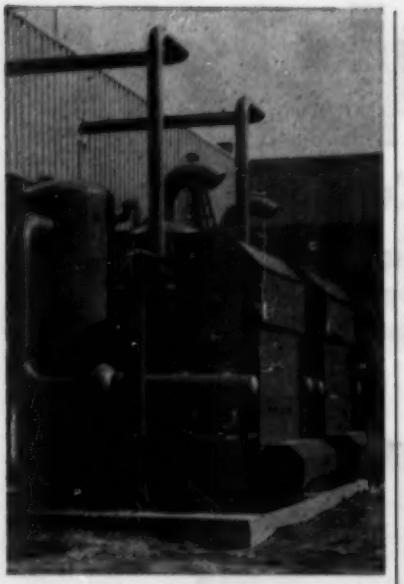
For more than 40 years Norblo has engineered and supplied installations of every size in the rock products, smelting, chemical, metal working, milling and processing fields. It pays you to get the facts about Norblo Dust and Fume Collecting Systems. Give us a description of your problems.

The Northern Blower Company

Engineered Dust Collection Systems for All Industries

6422 Barberton Ave. OLympic 1-1300 Cleveland 2, Ohio

Circle 149 on READ-N-CIRCLE card for more data



This Niagara Aero After Cooler also cools compressor jacket and intercooler water.

COMPRESSED AIR
• Lower in Cost
• Drier and Cooler

THE NIAGARA *AERO* AFTER COOLER offers a completely self-contained method replacing both shell-and-tube cooler and cooling tower. It is independent of a large supply of cooling water and consistently reduces compressed air temperatures to below ambient.

Drier air gives you better operation and lower costs in using all air-operated automatic instruments, tools and machines, paint spraying, sand blasting and moisture-free air cleaning.

Direct saving in the cost of cooling water saves the price of the Niagara *Aero* After Cooler in less than two years.

Niagara *Aero* After Cooler assures all these benefits because it cools compressed air or gas below the temperature of surrounding atmosphere; there can be no further condensation in your air lines. It condenses the moisture by passing the air through a coil on the surface of which water is evaporated, transferring the heat to the atmosphere. It is installed outdoors, protected from freezing in winter, proven in service on the largest plant utility systems.

Write for Bulletin No. 130

NIAGARA BLOWER COMPANY

Dept. I.P., 405 Lexington Ave.
NEW YORK 17, N. Y.
District Engineers in Principal Cities of U. S. and Canada

Circle 110 on READ-N-CIRCLE card

free bulletins

. . . starts on page 80

589-Steam trap handbook

Catalog 68G, 31 pages, describes and illustrates complete line of steam traps, strainers, regulating and reducing valves, separators, and vacuum and lifting traps. STRONG, CARLISLE & HAMMOND COMPANY.

Turbines

590-How steam turbines work

For a clear picture of how single-stage steam turbines operate, you will want Bulletin 1954C. Information on availability of various frames for single-stage applications, details on variable speed governors, and other features are included. Eight pages. WORTHINGTON CORP.

591-Design of multistage turbines

Smaller framed, multistage turbines are featured in six-page bulletin. Overspeed governor, governor valves, blades, diaphragms, and many other design features are discussed. TERRY STEAM TURBINE CO.

592-Speed control fundamentals

"Fundamentals of Turbine Speed Control," 32-page Brochure H-21, is an educational piece intended to clarify the operation of common types of automatic speed control for steam turbines. Simplified diagrams illustrate operating principles of actual control systems. ELLIOTT CO.

593-Turbine capacity curves

Bulletin T-54 shows several applications of dependable turbines, gives operating ranges and specifications. Includes capacity curves. Four pages. L. J. WING MFG. CO.

Valves and regulators

594-Steam-jacketed valves illustrated

"Viscous Materials," four-page Folder E-200, will be of special interest to engineers of plants in which viscous materials are handled. Illustrations of steam-jacketed valves include a large cross section and an exploded view. EVERLASTING VALVE CO.

595-Why not a solenoid valve?

If you use direct operated solenoid valves for automatic or remote flow control of liquids and steam up to 400 F, or of high viscosity liquids you will want to read 11-page Bulletin V-2. Normally closed, normally open, explosion-proof normally closed, and three way valves are shown. THE JOHNSON CORP.

596-Complete control valve manual

Manual No. 14 contains illustrations, dimension drawings, and recommended installations for valves in sizes from ⅛ inch to 1 inch. Descriptive material on two-, three-, four-, and five-way valves is also included. Control-system valves may be solenoid, pilot, cam, foot, or hand actuated. Eight pages. VERSA PRODUCTS COMPANY.

FREE COPIES

For free copies of these handbooks, bulletins, and catalogs just circle the key numbers on the READ-N-CIRCLE card on page 83.

597-Pneumatic switches, valves

Two-page Leaflet 350 describes pneumatic relays and pilot valves, pressure-electric switches, and electric pneumatic valves. Included are gradual direct acting relays, gradual reverse acting relays, and gradual retarded, advanced, and minimum pressure relays. THE POWERS REGULATOR CO.

598-Accurate valve sizing manual

Comprehensive and easy-to-understand discussion of the importance of proper valve sizing is contained in Bulletin 120-2-55. Also contains formulae and nomographs for sizing valves to meet any conditions of steam, liquid, and gas flow. Additional tables of flow coefficients for the many configurations of diaphragm-control inner valves are also given. Twenty-four pages. BLACK, SIVALLS & BRYSON, INC.

Vibration and noise control

599-Control pipeline surges

Magnilastic Hydropads for elimination of water hammer, and dampening of pulsations induced by reciprocating pumps are described with engineering data in Catalog 52. Units can also be used as accumulators in hydraulic systems and for accommodations for excess fluid volume that results from thermal expansion. A table on determination of expansion in pipelines heads a section on expansion joints. Thirty-six pages. COOK ELECTRIC COMPANY.

Waste disposal

600-Refuse and wood burning

Engineering data concerning spreader stokers installed to burn refuse or wood are contained in 24-page Booklet 505.

Stationary, manual dumping, power dumping, and traveling grate installations having maximum capacities from 10,000 to 275,000 pound steam per hour are described. DETROIT STOKER CO.

601-Sewage reference manual

Reference manual for engineers interested in proper disposal of sewage and industrial wastes is now available. Bulletin 240 contains complete list of apparatus used for the testing and control of sewage effluent by American Public Health Association methods. Eight pages. PRECISION SCIENTIFIC COMPANY.

Water supply and treatment

602-All phases of purification

"Boiler Feedwater Treatment," 19-page Bulletin BFT-1, covers Inversand zeolite softeners, color process chemical softeners, and demineralizing units, including silica removal by ion exchange. HUNGERFORD & TERRY, INC.

603-Cooling system water dangers

Dangers of scale and corrosion in cooling systems and organic contamination of cooling system water are outlined in six-page folder "Cooling Water." It describes solutions found to cooling water problems in oil, steel, and other industries. HALL LABORATORIES, INC.

604-Clean your boiler in operation

How to clean your boiler while in operation is explained in four fact-filled pamphlets. The Ever Clean boiler process removes rust, prevents corrosion, and increases boiler efficiency. Also includes data on solving algae problems. NORTH AMERICAN MOGUL PRODUCTS.

605-Demineralizing handbook

"Handbook on Demineralizing," 40-page Bulletin 5800-B, compares various methods of water treatment including demineralizers and evaporators. It goes into characteristics of various types of available cation and anion exchange materials and their costs. COCHRANE CORP.

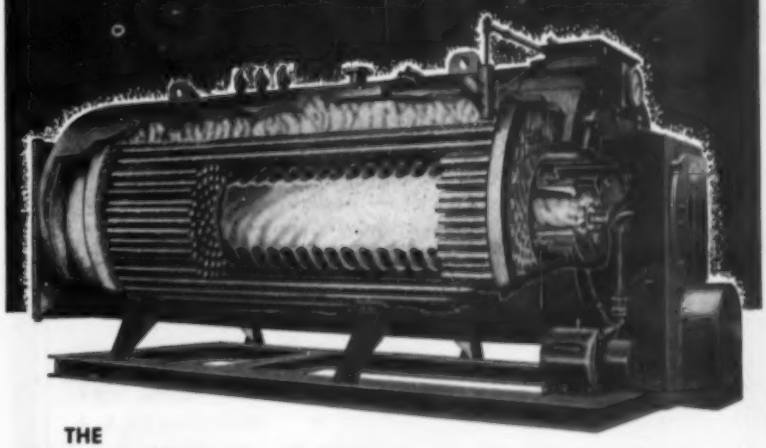
606-Pocket-size water testing kit

Water hardness can now be measured to the nearest 0.2 grain per gallon in an on-the-spot test that takes only one minute. Three-ounce kit consists of a glass vial and a bottle of reagent, is contained in a white plastic box that easily fits the pocket. Complete details of the Zeo-Kit are given in Bulletin 7RE55. CALGON, INC.

607-Acid on cooling towers

Discussion of how chemical and bacteriological attack can be controlled by acid treatment and wood preservatives to kill fungi appears in Technical Paper No. 130. A good reference work for anyone interested in cooling towers. Eight pages. W. H. & L. D. BETZ.

GET YOUR
STEAM and HOT WATER
FROM A LOW COST PRODUCER!

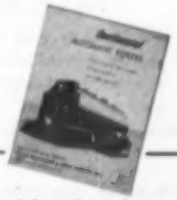


THE
Continental AUTOMATIC BOILER

- generates the steam and hot water you need at low fuel cost and with little maintenance.
- is highly efficient—over 80% guaranteed—due to its unique "spinning gas technique".
- can be opened for cleaning or inspection by one man in less than ½ hour, for it has hinged doors at both ends.
- distributes heat evenly to the rear tube-sheet and all return tubes. This results in balanced water circulation and uniform longitudinal expansion of the entire pressure vessel.
- has long service life because of free, rapid water circulation, uniform heat transfer, simplicity of construction and quality workmanship.

Fully automatic, Continental Boilers are used for hot water and high or low pressure steam applications. Units range from 20 to 500 hp and can be gas, oil or combination fired.

Write for catalog and the name of your nearest distributor. Let us bid on the next boiler you need.



Send for all the facts on the Continental Automatic Boiler.

Continental AUTOMATIC BOILERS
BOILER ENGINEERING and Supply Company, Inc.
4 Manavon St. • PHOENIXVILLE, PA. • Phone 5832

Circle 102 on READ-N-CIRCLE card for more data

NON-FLUID OIL

TRADE MARK REGISTERED

MORE and BETTER Lubrication Per Pound!

NON-FLUID OIL lubricates dependably, until entirely consumed, protecting costly anti-friction bearings and prolonging their life. Dollar for dollar, pound for pound, day in and day out, NON-FLUID OIL gives *more* and *better* lubrication.

NON-FLUID OIL is tops for motors! Motors run longer, cooler, and cleaner with NON-FLUID OIL. Ordinary oils leak, creep, or throw out and soak motor windings — resulting in short circuits and costly burn-outs. Greases thin out and act the same way.

See NON-FLUID OIL in action. Write for free testing sample, without obligation, and useful Bulletin.

NEW YORK & NEW JERSEY LUBRICANT COMPANY

292 Madison Ave., New York 17, N. Y. • Works: Newark, N. J.

WAREHOUSES: Birmingham, Ala. • Atlanta, Ga. • Columbia, Ga. Charlotte, N. C. • Greensboro, N. C. • Greenville, S. C. • Chicago, Ill. Springfield, Mass. • Detroit, Mich. • St. Louis, Mo. • Providence, R. I. Also represented in other principal cities.

NON-FLUID OIL is not the name of a general class of lubricants, but is a specific product of our manufacture.

Circle 121 on READ-N-CIRCLE card for more data

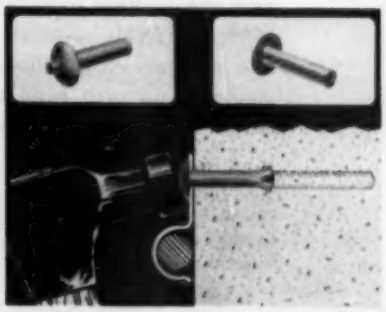
new products

. . . starts on page 10

plug, which facilitates installation. Indicating lights can be located at any remote point. GEMS COMPANY.

FREE INFORMATION

For detailed free information on these products just circle the key numbers on the READ-N-CIRCLE card on page 83.



720-Simple masonry fastener

Fast, low-cost method of attaching metal to masonry is now possible with a one-piece drive rivet. It can be used to nail to brick, cinder block, and concrete, and also for sandwich construction of side walls, enamel facing plates, and corrugated siding. Installation is simple: drill the hole, insert the rivet, and drive with an ordinary hammer. Made of aluminum with stainless steel pins, rivets are available in six lengths, from 1⅛ through 1¾ inches. SOUTHCO DIVISION, SOUTH CHESTER CORPORATION.

721-Gold lenses reduce eye strain

Interchangeable gold methyl methacrylate lenses for inspection wear now come in feather-light safety spectacle frames. Gold lenses reduce eye fatigue by softening glare and absorbing almost all harmful ultra-violet rays. Also improve contrast between black and white, making objects clearer. Optically perfect, lenses are made of shatterproof plastic, and provide ex-

cellent protection against flying particles. Available with either full side-shield or full cup protection. WATCH-EMOKET OPTICAL CO.

722-Portable wet extinguishers

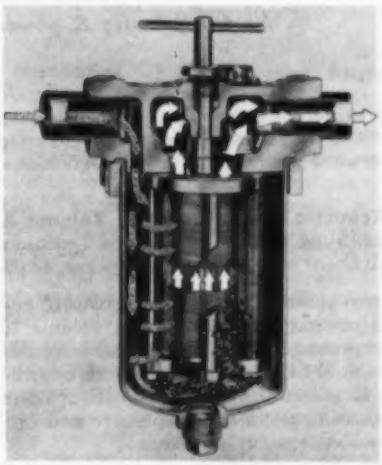
New line of wet-chemical portable fire extinguishers include pressurized and brass container units. Combina-

tion water and antifreeze extinguishers are available in 2½-gallon pressure-operated, and 2½- and 5-gallon pump-tank type extinguishers. CTC and CBM extinguishers come in 1-quart, 1½-quart, and 1-gallon sizes, pressurized with either air or nitrogen to 150 psi. All portable extinguisher shells are tested to 500 psi and carry Underwriters' Laboratories approval. WALTER KIDDE & COMPANY, INC.

723-Micronic filter is cleanable

Small, cleanable, all-metal, edge-type filter stops all particles larger than 40 microns. Flows can be handled in a space six times smaller

than with a cartridge-type unit under similar conditions because of unusually low pressure-drop across the



Super Auto-Klean filter. Cleaning can be done without stopping flow, simply by turning the handle by hand or motor drive. Accumulated sludge may be drained off through a bottom drain plug. CUNO ENGINEERING CORPORATION.

724-High-pressure portable compressor

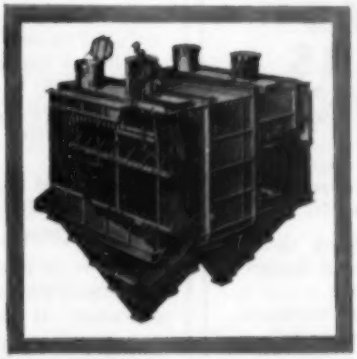
New compressor with a capacity of 1.75 cfm of free air and a rated discharge pressure of 3000 psi weighs only 38 pounds. Overall height is 17 inches. Assembly includes compressor, oil filter, moisture separator, self-resealing relief valve, 0 to 4000-psi pressure gauge, and an integral 110- to 220-volt 60-cps ac electric motor. Compressor operates at 3450 rpm and

has three stages of compression. Both compressor and motor are air cooled. Low discharge rate insures oil- and moisture-free air. THE CORNELIUS COMPANY.

Buell "LR" Fly Ash Collectors GUARANTEED for TOP EFFICIENCY

Buell Cyclone Collectors also deliver extra efficiency, due to exclusive shave-off design which harnesses backflow and puts it to work!

The Buell Guarantee of Efficiency which goes with every installation of an "LR" Fly Ash Collector is based on many years of successful field experience. The simplicity of design and proved efficiency of performance makes the "LR" ideal for low and high pressure boiler operations up to 2000 BHP with either natural or mechanical draft.



Buell "SF" Electric Precipitators with exclusive Spiralectrodes and Continuous Cycle Rapping have established brand new concepts in dust collection efficiency.

FREE BOOKLET!
"The Collection and Recovery of Industrial Dusts." Write to: Buell Engineering Company, Dept. L-90 70 Pine Street, New York 5, N. Y.

buell

MECHANICAL ELECTRICAL

Experts at delivering Extra Efficiency in
DUST COLLECTION SYSTEMS

Circle 101 on READ-N-CIRCLE card for more data

Valuable help for waste disposal problems . . .

INDUSTRIAL WASTES

Their Disposal and Treatment

Edited by

WILLEM RUDOLFS

Chairman, Dept. of Sanitation, New Jersey Agricultural Experiment Station, Rutgers University

ACS MONOGRAPH No. 118

1953, 450 pages, $9.50

Prepared by a group of experts with long experience in the treatment of industrial waste materials, this much-needed book offers a thorough, completely-up-to-date study of the disposal problems of such industries as meat packing, leather, pulp and paper, coal, etc.

Here, the physical, chemical and biological considerations of each type of problem are developed in full detail. You'll find complete information on the scope of the waste treatment problem in general, the basic principles of stream pollution and self-purification, and modern views, theories and applications of individual treatment problems. Although principal stress is placed on treatment, ample attention is also given to the volumes and characteristics of wastes and to the recovery of by-products.

Of immense value to all chemists and engineers concerned with specific waste problems, to municipal officials charged with control of pollution, and to consulting engineers in the design of waste treatment plants.

Order directly from

INDUSTRY & POWER

Commercial Bank Building • St. Joseph, Michigan

How to plan and design safe, economical electric power distribution systems

INDUSTRIAL POWER SYSTEMS HANDBOOK

DONALD BEEMAN, Editor

Mgr., Industrial Power Engineering General Electric Company

971 pages, 516 illus., $12.50

Step by step, this practical handbook shows you every major phase in planning and designing industrial power systems. You are given a mine of valuable data and engineering methods that pay out when preparing a new installation or modernizing or expanding an old one.

This book is your storehouse of proven methods, practices, and data . . . that pay dividends in every phase of planning an industrial electrical distribution system.

READ THIS BOOK 10 DAYS FREE

INDUSTRY & POWER

Commercial Bank Bldg., St. Joseph, Mich.

good books

. . . for industry & power

Readers wanting to obtain copies of these books may order through INDUSTRY & POWER. *Send check covering cost and we will forward your orders to the publishers.*

Handbook of Acoustic Noise Control, Volume I, Physical Acoustics, Supplement 1; Office of Technical Services, U. S. Department of Commerce; 315 pages; $8.00.

This supplement to Volume 1, "Physical Acoustics," enlarges and expands coverage of the original volume to present the latest experimental and theoretical information available in the field of noise control. These two reports, with Volume II (which studies the effects of noise on human behavior), comprise a comprehensive and up-to-date study of noise generation and control.

New sections have been added on sound absorptive properties of materials, new designs for acoustic shielding structures, transmission of sound through cylindrical shells, ventilating fans and systems, and noise generated by axial-flow compressors. Enlarged sections on wall construction and floating doors, propeller noise, attenuation of sound in lined ducts, and the use of acoustic resonators are also presented. This is a worthwhile addition to the library of any engineer interested in noise and its abatement.

Proceedings of the American Power Conference, Volume XVII; Illinois Institute of Technology; 722 pages; $6.00.

This volume comprises the proceedings of the Seventeenth Annual Meeting of the American Power Conference held in Chicago last March. It contains transcripts of all the technical sessions including general interest, electrical, mechanical, nuclear energy, and water technology. A convenient authors' index is included. This book will keep those who were unable to attend the Conference fully posted and will be a valuable handy reference for those who did attend. Here, in one volume, is a wealth of experience reported by the experts in their fields. It will be useful to any engineer who is responsible for the selection, operation, and maintenance of Industry's Power Services.

Chemical Engineering Cost Calculation by Robert S. Aries and Robert D. Newton; McGraw-Hill Book Company; 263 pages; $6.00.

This book is a practical treatment for plant engineers concerned with estimating costs of new units and costs of operation. It outlines the principles of cost estimation and provides quantitative data for application of the technique to solving problems that crop up frequently in industrial engineering. For instance, a chapter on manufacturing cost includes tables that show maintenance cost of equipment and piping, power, steam, and water requirements for various processes, and power services rates. The book will be a source of ideas for making economies in both selection and operation of equipment. The material is extremely well presented, the typography is excellent, and the illustrations, which are easy to understand, are not crowded. The reader has the feeling that no pressure is being put on him. Each chapter has

a very complete bibliography for those wanting more information. This book will serve as both a text and a reference for all engineers who want to evaluate their efforts in terms of cost and profit, and direct their work toward greater productivity.

Handbook of Engineering Materials, edited by Douglas F. Miner and John B. Seastone; John Wiley & Sons; 1380 pages; $17.50.

This handbook is a single source of useful and authentic information on the useful materials of construction that will be of value to most engineers, no matter what their realm might be. Of course, it is not so detailed as a textbook, but suggested sources of more detailed information are given. The book is well arranged in four sections of related or similar materials. Tables are presented in a clear style. The authors have assumed the readers' engineering background regarding basic knowledge and vocabulary, with the result that the book is very comprehensive and yet is not too big to handle. Typography, although small, is clear and easy to read. Graphic illustrations are well drawn. This handbook deserves a place on any engineer's bookshelf, and may well replace several volumes already in use.

Conduction Heat Transfer, by P. J. Schneider; Addison-Wesley Publishing Company; 395 pages; $12.50.

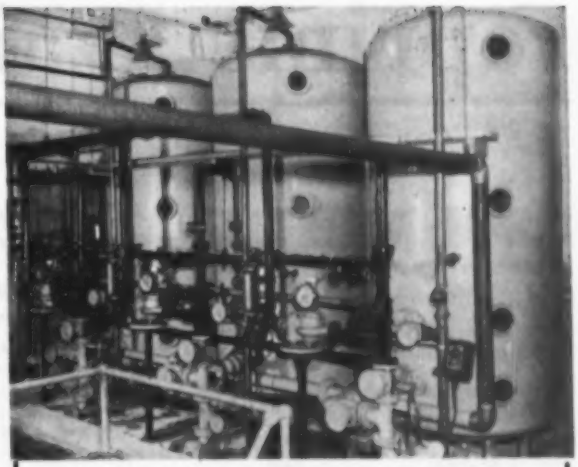
Here is an up-to-date textbook on a subject that has been somewhat neglected. The author has done a great deal toward better organizing of the subject matter, yet it is still treated thoroughly. This is no book for the engineer who wants a quick refresher course—a good knowledge of calculus is required before the reader can make much progress. Many numerical examples are given, and answers are included. The book has modern typography and excellent illustrations. It is a valuable text for those engineers who want a course in heat transfer, but for most it will require some spadework.

Synthetic Lubricant Sources, by Wright Air Development Center; U.S. Department of Commerce, Office of Technical Services; 168 pages; $4.25.

A survey of the actual and potential supply of materials for synthetic lubricants includes data from many sources on over 800 compounds. This two-year program, conducted by the Standard Oil Development Company for the Air Force, surveyed the potential availability of raw materials for ester-type lubricants for high-power aircraft engines. The report reveals the best presently available, and the most promising future sources, as determined by the study. Detailed analyses are given of important lubricant characteristics of the esters studied, such as low melting and pour points, stability towards oxidation, and heat, and good viscosity relationships.

1950-51 Bibliographic Survey of Corrosion; National Association of Corrosion Engineers; 430 pages; $12.50.

More than 4400 abstracts and 4000 authors are classified and indexed in the 1950-51 Bibliographic Survey of Corrosion. The book sells to members of NACE for $10. This is the fourth of the series of bibliographies published by NACE. Each volume includes abstracts of corrosion literature published in the indicated years, classified according to NACE's Abstract Filing System and including both alphabetical subject and author indices.



18,000 GPH H&T UN-A-BED DEMINERALIZER PLANT

. . . a typical H&T installation

Since 1943, we've been building demineralizer plants. All sizes, all capacities — manual or automatic available. Highest quality, attractive prices, fully guaranteed. Hundreds of units in service.

Also a complete line of other water conditioning systems.

Write for details.

HUNGERFORD & TERRY, INC.

CLAYTON 1, NEW JERSEY

Circle 147 on READ-N-CIRCLE card for more data

HALLOWELL

SOLID STEEL COLLARS

Size-marked for quick identification in 42 stock sizes

And these precision-machined solid steel collars stay put because they are held in place on the shaft by the famous UNBRAKO Self-Locking Socket Set Screw. Authorized industrial distributors carry complete stocks in sizes from 1/8" to 3" inclusive. Write for Bulletin 868. STANDARD PRESSED STEEL Co., Jenkintown 39, Pa.

HALLOWELL POWER TRANSMISSION DIVISION

SPS

JENKINTOWN PENNSYLVANIA

Circle 126 on READ-N-CIRCLE card for more data

reprints available

. . . from industry & power

Reprints of Special Reports and feature articles that have appeared in INDUSTRY & POWER can be ordered from Reader Service Department, INDUSTRY & POWER, Commercial Bank Building, St. Joseph, Michigan.

Feature article reprints

Reprints of the following articles are available on single copy orders free of charge:

- *A Better Water At Lower Cost*
- *Big Savings For A Small Plant*
- *Boiler Blowdown Control*
- *Bulk Handling as a Business*
- *Coal Dust . . . Stopped Before It Starts*
- *Electrically Heated Pipelines Keep Fuel Oil Flowing*
- *Engineered Insulation*
- *For Better Lighting At Less Cost, Frost Your Windows*
- *How to Specify a Water-Tube Package Boiler*
- *New Chemical Grouting Method Prevents Flooded Floors*
- *Noise Abatement In Industry*
- *Packaged Units for Coal Firing*
- *Permanent Tank Insulation Costs Less*
- *Profit From Wastes Purchased Vs Generated Power*
- *Purchased Vs Generated Power*
- *Put Dissolved Air to Work*
- *Reclaim Your Waste Heat*
- *Selecting Fuel and Firing Equipment*
- *Selecting taps on Power Transformers*
- *Shell Selects Package Boiler for Outdoor Operation*
- *Small Filters Do Big Job*
- *Solving a Fly Ash Problem*
- *Synchronous Motors Do Two Jobs At One Time*
- *Tailor-Made Fire Protection*
- *Television . . . The Eyes of Industrial Control*
- *Vibration Is Tamed So Simply*
- *Which Should It Be . . . Electric or Pneumatic Controls?*
- *Why High Temperature Water?*
- *Will It Pay to Incinerate Your Waste?*

Special Report reprints

Individual copies of Special Report Reprints will be sent free upon request. Additional copies are priced as follows: 2 to 24 copies are 25¢ each; 25 to 49 copies are 20¢ each; 50 to 99 copies are 15¢ each; more than 99 copies are 10¢ each. Special Report Reprints available are:

- *Adjustable Speed Drives and Electrical Controls*
- *Combating Corrosion From Industrial Chemicals*
- *Contaminants in the Air*
- *Control Valves and Positioners*
- *Demineralization—A Means to Purer Water*
- *Industrial Waste Treatment*
- *In-plant Electrical Distribution*
- *The Packaged Boiler Picture*
- *A Thermodynamics Refresher (Parts I through VI)*

Classified Advertising

Master GLASSES
MAGNIFYING
HIGH PRESSURE GASKETS
All sizes to fit your gages
ERNST WATER COLUMN & GAGE CO.
Send for Catalog LIVINGSTON, N. J.

CONVERT TO LP.GAS
Save up to $500 a year per truck
Write to
PEACOCK CORP.
WESTFIELD, N. J.

complete Anhydrous Ammonia and L.P. Gas plants
designed - installed
H. Emerson Thomas & Associates, Inc.

Transformer Production Man
Rapidly growing mfg. of power and light dist., dry and liquid filled transformer requires exp. prod. man. Ex. Opp. and future. Write fully in confidence. Box No. L22, INDUSTRY & POWER, St. Joseph, Mich.

Save on Your INDUSTRIAL TRACK
FOSTER QUALITY
FULLY GUARANTEED
RELAYING RAILS
Handle more cars better—cost less to install and maintain. Foster stocks all Rail Sections 12# thru 175#, Switch Material and Track Accessories.
SEND FOR CATALOGS
RAILS - TRACK EQUIPMENT - PIPE - PILING
L B FOSTER co
PITTSBURGH 30 • NEW YORK 7 • CHICAGO 4
ATLANTA 5 • HOUSTON 2 • LOS ANGELES 5

UTILITY ENGINEER

Excellent opportunity for a man looking for more responsibility and a chance to grow with an expanding Division of General Motors.

Should be capable of supervising the operations and maintenance of boilers in excess of 100,000 lbs. per hour, air compressors of 1,000 horsepower or more, gas generating and auxiliary equipment. Must be graduate engineer, mechanical preferred. Five years minimum experience in supervision of maintenance and operation of steam generating equipment. Knowledge of air compressor and gas generator operation and maintenance desirable.

Send letter and resume' to:

Salaried Personnel Department
Rochester Products Division
General Motors Corporation
1000 Lexington Avenue
Rochester 3, New York

names make news

. . . personalities from industry & power

American Gas Association has elected **Lyle C. Harvey**, senior vice president of Carrier Corporation, to the post of director. Harvey is past president of Gas Appliance Manufacturers Association and currently serves as treasurer and director of that organization.

Habach

Feldbush

Worthington Corporation has announced several promotions. **George F. Habach** was elected to vice president in charge of engineering. He will assume the full administrative responsibility for the company's engineering activities, including research and development. **Harry A. Feldbush** a veteran of 40 years with the corporation will continue on the technical staff as consultant on special engineering problems. **Vincent T. Lopez** becomes manager of manufacturing department at the Succasunna Works, succeeding **Robert C. Tierney.**

Reed

Guyette

Dravo Corporation Machinery Division, has announced the appointment of **Kenneth D. Reed** to become manager of its newly-created lubrication section. Reed is recognized as an authority on industrial lubrication systems and has written many technical papers on the subject. He was formerly affiliated with The De Laval Separator Company in a similar capacity.

The New York Air Brake Company has named **Frederick L. Guyette** chief plant and equipment engineer. Guyette, a veteran of 25 years' service, will be responsible for plant layout, machine tools, buildings, and equipment for the company's manufacturing divisions.

US Steel Corporation has made personnel promotions. **Robert A. McClure** becomes general superintendent of Gary Sheet and Tin Mill. **Robert B. Freeman** has been appointed assistant general superintendent. McClure succeeds **John E. Angle**, recently appointed vice president, industrial engineering. **A. L. Billeter**, formerly general superintendent of the company's Irvin Works, becomes assistant to vice president, operations-steel. **T. W. Hunter**, now assistant general superintendent of Irvin Works, will succeed Billeter as general superintendent.

Borg-Warner Corporation has elected **A. W. Rose** vice president and general manager of Petro-Mechanics Research Division. Rose succeeds **Ernest L. Black**, who resigned to become an executive of Technicolor Motion Picture Corporation.

Rice

Felix

Hagan Corporation has elected **Owen Rice** director of Hagan and its subsidiaries, **Calgon, Inc., Hall Laboratories, Inc.,** and **The Buromin Company.** Rice fills a vacancy created by the retirement of **E. M. Chaney.** Rice is a registered professional engineer in Pennsylvania.

De Laval Steam Turbine has named **Samuel P. Felix** vice president. Felix, in addition to his new post as vice president, will continue to serve as general manager of Turbine Pacific.

MODERN COAL AND ASH HANDLING SYSTEMS FOR MODERN PLANTS INCLUDE

Kalamazoo

VITRIFIED GLAZED TILE

INDUSTRIAL STORAGE SILOS

Coal stays dry, doesn't freeze, doesn't deteriorate. Expensive compaction operations required by outside storage are eliminated. *Kalamazoo* first cost is the *only* cost—no maintenance needed.

Bring your coal and other bulk storage problems to *Kalamazoo*—over 50 years' experience.

Kalamazoo coal storage silos at large midwestern hospital.

Bulletin 1183-B gives you the complete *Kalamazoo* story. Get your copy today.

INDUSTRIAL STORAGE BIN DIVISION

Kalamazoo TANK and SILO COMPANY

1241 HARRISON STREET KALAMAZOO, MICH.

"LIQUIDS WORTH STORING ARE WORTH MEASURING"

with a

LIQUIDOMETER

Tank Gauge

- FOR GAUGING LIQUIDS OF ALL KINDS
- 100% AUTOMATIC
- APPROVED BY UNDERWRITERS' LABORATORIES

THE LIQUIDOMETER CORP.
36-32 SKILLMAN AVE., LONG ISLAND CITY, N.Y.

Circle 105 on READ-N-CIRCLE card for more data

NEW!

INSTANT SETTING FLOOR PATCH!

Repair broken factory floors without the usual traffic tie-up. Simply shovel INSTANT-USE into hole or rut—tamp smooth—truck over! No waiting! INSTANT-USE bonds tight to old concrete—right up to a feather edge. It's tough. Wears like iron. Won't crack or crumble. Install complete overlay where floors are badly chewed up. Used indoors or out. Immediate shipment.

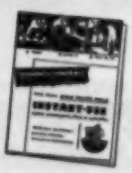
MAIL COUPON FOR TRIAL OFFER AND FREE BROCHURE

INSTANT-USE

PLEXROCK COMPANY (Offices in principal cities)
3606 Filbert St., Philadelphia 1, Pa.

Please send me complete INSTANT-USE information, details of TRIAL ORDER PLAN and Free INSTANT-USE BROCHURE—no obligation. (Clip and attach Coupon to Co. letterhead).

Name .....
Title .....
Company .....
Address .....



Circle 123 on READ-N-CIRCLE card for more data

advertisers' index

Airetool Mfg. Co. ..... *
Allis-Chalmers Mfg. Co. 14-15
American-Marsh Pumps, Inc. 76
Ames Iron Works, Inc. ..... *
Annin Co. ..... *
Armstrong Machine Works ..... *
Atlantic Metal Hose Co. ..... *
Aurora Pump Div., N. Y. Air Brake Co. 78
Automatic Electric Sales Co. 2

Babcock & Wilcox Co.
Boiler Div. 22-23
Refractories Div. ..... *
W. H. & L. D. Betz 11
Bigelow-Liptak Corp. ..... *
Boiler Engineering and Supply 93
Buell Engineering Co. 95
Burgess-Manning Co. 77
Bussmann Mfg. Co. ..... *
Byron Jackson Div., Borg-Warner Corp. ..... 9 & 102

Chapman Valve Mfg. Co. 65
Chesapeake & Ohio Railway 13
Cochrane Corp. 101
Coppus Engineering Corp. ..... *
Darling Valve & Mfg. Co. 81
Dart Union Co. 33
Dearborn Chemical Co. 27
De Laval Steam Turbine Co. 17
Dynamatic Div., Eaton Mfg. Co. ..... *

Electric Auto-Lite Co. ..... *
Engineer Co. 88
Enos Coal Mining Co. 6
Erie Bolt & Nut Co. ..... *
Erie City Iron Works ..... *
Ernst Water Column & Gage Co. 26
Everlasting Valve Co. 7

Flexrock Co. 100
L. B. Foster Co. ..... *

General Coal Co. 79
Graphic Systems ..... *

Hays Corp. ..... *
Heinemann Electric Co. 89
Hennessy Co. ..... *
Hilliard Corp. ..... *
Hungerford & Terry, Inc. 97

Infilco Inc. 21
I-T-E Circuit Breaker Co.
Small Air Circuit Breaker Div. ..... *
Switchgear Div. 3
Illinois Water Treatment 90

Jerguson Gage & Valve Co. ..... *
Johns-Manville ..... *
Johnson Corp. ..... *

Kalamazoo Tank & Silo Co. 99
Kane Laboratories ..... *
Kirk & Blum Mfg. Co. ..... *

L*A Water Softener, Inc. 87
Leslie Co. ..... *
Liquidometer Corp. 100
Lovejoy Flexible Coupling ..... *

Mansel, Div. of Houdaille-Hershey Corp. 19

National Airoil Burner Co. 8
N. Y. & N. J. Lubricant Co. 94
Niagara Blower Co. 92
Northern Blower Co. 91

Petro 67
Pick Mfg. Co. ..... *
Powers Regulator Co. ..... *
Prat-Daniel Corp. ..... *
Preto Tools ..... *

Ranney Method Water Supplies, Inc. ..... *
Raybestos-Manhattan, Inc. ..... *
Republic Mfg. Co. ..... *

Claude B. Schneible Co. 30
Sinclair Refining Co. ..... *
Smooth-On Mfg. Co. ..... *
Sorgel Electric Co. 69
Spence Engineering Co., Inc. 73
Sprague Electric Co. 77
Standard Pressed Steel Co. 97
Strong, Carlisle & Hammond Co. ..... *
Struthers Wells Corp., Titusville Iron Works Div. 31
Subox, Inc. ..... *
Superior Combustion Industries, Inc. 82
Superior Electric Co. ..... *

Texas Company ..... *
Titusville Iron Works, Div. of Struthers Wells Corp. 31

Union Iron Works 29
Universal Atlas Cement Co. 71

Edwin L. Wiegand Co. ..... *
Thomas C. Wilson 75
Worthington Corp., Vertical Turbine-Industrial Division 25

Yarnall-Waring Co. 34

Where an * appears after the name the advertisement does not appear in this issue, but appeared in one or both of the two previous issues.

problems in water conditioning...

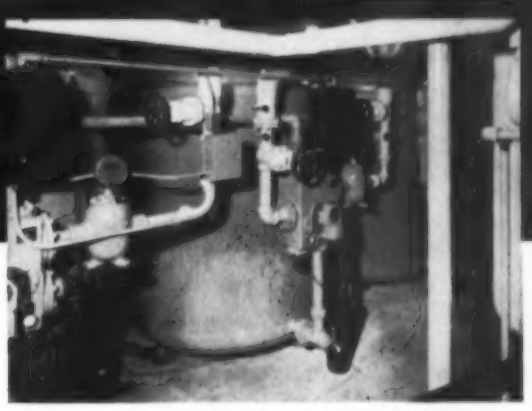
SERVICE

RINSE

BACK WASH

REGENERATE

SIMPLIFIED CONTROL



COCHRANE ZEOLITE SOFTENER DELIVERS WATER of zero hardness by the soap test. All commonly known zeolites—greensand, synthetic gel, sulfonated coal and the various styrene medium capacity resins are available for most practical individual application. Units can be adapted for automatic operation. Three 6' x 6' fully automatic Cochrane Zeolite Softeners above provide a capacity of 288,000 lbs. per hr.

Cochrane

Hydromatic Valve *assures* easy, accurate control of ion exchange equipment

Here is a valve so simple to operate that no knowledge of softening equipment or of the ion-exchange process is required!

The Cochrane Hydromatic Valve consists of an integrated nest of hydraulically-actuated diaphragm valves. Valves are so constructed that it is impossible for any of them to be out of position during operation. Compass point positions for four operating stations on the pilot reduce operating error—assure maximum delivery of high quality effluent without danger of contamination. "Drop tight" construction eliminates the possibility of scoring. Compact, easy to operate Hydromatic Valve is designed for years of dependable operation. Write for Bulletin 4520-B.

The Cochrane Corporation designs and manufactures complete lines of deaeration, precipitation, ion exchange, and water conditioning equipment . . . Consult Cochrane First!

COCHRANE CORPORATION WATER AND HEAT ENGINEERS SINCE 1863 PHILADELPHIA

Cochrane CORPORATION

Representatives in 30 principal cities in U.S.; Toronto, Canada; Paris, France; La Spezia, Italy; Mexico City, Mexico; Havana, Cuba; Caracas, Venezuela; San Juan, Puerto Rico; Honolulu, Hawaii.
Pottstown Metal Products Division—Custom built carbon steel and alloy products

3108 N. 17TH STREET, PHILADELPHIA 32, PA.

NEW YORK • PHILADELPHIA • CHICAGO

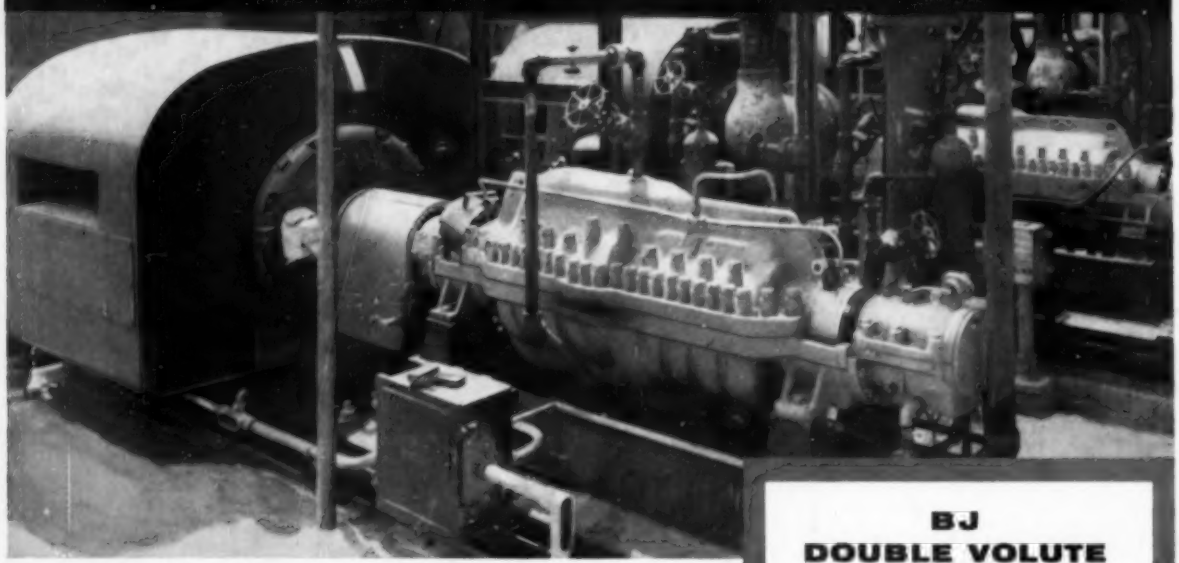
Demineralizers • Hot Process Softeners • Hot Zeolite Softeners • Dealkalizers • Reactors • Deaerators • Continuous Blowoff Systems • Condensate Return Systems • Specialties

AD. 3.10

Circle 142 on READ-N-CIRCLE card for more data

NEW Byron Jackson DVMX
SPLIT CASE BOILER FEED PUMP

...Engineered for Medium Size Power Plants



This new Byron Jackson DVMX split case pump gives the same trouble-free service that BJ barrel type Boiler Feed Pumps have been providing for the larger power plants in the United States for many years. This DVMX model is engineered primarily for medium-sized power plants and delivers capacities to 2200 gpm, heads to 1200 psig. and temperatures to 350° F.

Here's what you get in the new DVMX

1 Horizontally-split case, with both nozzles in the lower half of the pump case, permitting removal of the top half of the case and the complete rotating element without disturbing the piping.

2 Double volute design which assures radial balance of the pump at all capacities.

3 Impellers arranged in equally opposed groups, assuring hydraulic axial balance without resorting to the use of any auxiliary high pressure balancing devices.

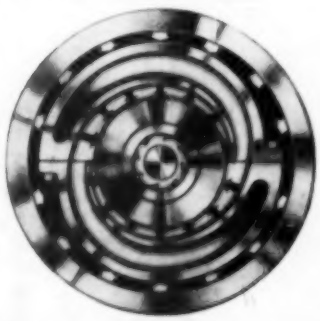
4 Available with reliable BJ high pressure Mechanical Seal especially designed for boiler feed service.

5 Furnished with a spacer type coupling for easy removal of the mechanical seal.

6 The thrust and radial bearings including the self-contained oiling system are of the same reliable construction that has proven so successful over the years in the larger BJ barrel type Boiler Feed pumps. The oiling system is of ample size to supply the driver bearings if desired.

BJ DOUBLE VOLUTE

By the use of BJ Double Volute inner cases, the flow is divided into two identical fluid channels with outlets 180° apart. Equal opposing forces are created, resulting in radial balance without pressure-bending moment on the shaft.



BJ MAKES BOILER FEED HISTORY!

Byron Jackson is building the world's largest boiler feed pump. This 12,000 HP pump will deliver 6,330 gallons per minute at total head of 6,400 feet, or about 2700 pounds per square inch, at a speed of 3510 RPM.

Byron Jackson

Division of Borg-Warner Corporation
P.O. 2017, Terminal Annex, Los Angeles 54, California

BJ

Circle 132 on READ-N-CIRCLE card for more data